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THE BURWELL SMALL HOLDINGS AFTER FOUR YEARS OF TENANCY.

J. H. DIGGLE.

THE tenants of Sir Charles Rose on the Crown Lands, Burwell, Cambridgeshire, completed last Michaelmas four years of tenancy. A correspondent to *The Times* (Mr. C. Adeane) wrote in 1906 as follows:—"The Burwell experiment will be a valuable object-lesson, and is being watched in its development as such. It is much too soon either to condemn or to pronounce it a success. For full results which can be depended on many years will be required, certainly not less than four or five." It is proposed in the following ticle to report the progress made during the four years, and review the position, with special regard to the employment labour, the productivity of the land, the output of stock id produce, and the economic result generally of the conrsion of a large Cambridgeshire farm into small holdings id allotments.

When at Michaelmas, 1906, Sir Charles Rose approached e Commissioner of Crown Lands with a view to leasing e estate for small holdings, the estate (comprising 18 houses id 917 acres) was being farmed at a loss by the Crown gents, in default of a tenant. A bailiff occupied the comodious farmhouse, thirteen married labourers employed on e estate occupied thirteen of the cottages, two cottages were to outside persons, and two cottages were empty. There

with adjoining premises, is occupied by a responsible tenant, who rents 45 acres of the remote arable land; two houses, larger than the others, are occupied by the tenants of the small farms attached to them; eleven of the cottages, formerly occupied by labourers, are tenanted by small holders; seven new cottages are occupied as allotment-homesteads; and the remaining five cottages are rented by allotment-holders and labourers. The tenants number eighty, and the estate may conveniently be divided into two parts—680 acres (about three-fourths) occupied by twelve resident holders, and 237 acres (about one-fourth) occupied as small holdings, allotments, and allotment-homesteads, the lots varying in size from half an acre to ten acres.

Employment of Labour.—At Michaelmas, 1906, the official list of the labourers employed on the estate contained thirty-eight names, and the wages payable for full time totalled £24 8*s*. per week. There were thirteen married resident labourers, eight sons of these labourers, and, living in the village near, seventeen casual labourers, comprising men, women, and boys. The resident labourers lived rent free. Full wages during the busy period preceding Michaelmas on the farm would probably not be less than the average wages over the year. On this assumption, the wages paid would total £1,250, or about 27*s*. 6*d*. per acre, a figure which closely approximates to the average wage paid upon similar farms in the county.

For three years the following question has been put to the twelve principal resident tenants, holding 680 acres of land, including the poorest land on the estate:—

During the past year how much have you spent on labour, including the value of the board and lodgings of any hired servant living in the house?

The total of the amounts returned are as follows:—

	£
1908	846
1909	1115
1910	1030

being an average of nearly £1,000 a year, or about 29*s*. per acre.

With respect to the hired labour employed on the remaining one-fourth of the estate, some of the tenants of the larger allot-

ments (5 to 10 acres) while ploughing and tilling their own land, hire manual labour at certain seasons. On the other hand, nearly all the tenants of the smaller allotments (one to five acres) hire horse labour and themselves do the manual labour. It may be fairly estimated that the amount expended on hired team labour for tillages and carting, and on manual labour is not less than £250 for the 237 acres. From returns received from these tenants it appears that on *manual* labour :—

A tenant of	8 acres	expended	£5
,,	,,	3 ,,	,,	35*s.*
,,	,,	1 acre	,,	20*s.*
,,	,,	2 roods	,,	12*s.*

The sums paid by allotment holders to "higglers" and carters could not be less than £1 per acre for tillages and harvesting an ordinary crop. Hence, it is difficult to avoid the conclusion that, taking the estate as a whole, the amount expended on hired horse and manual labour is not less than the total amount expended on hired manual labour when the estate was occupied as a single farm. At no time of the year have I found less than twenty persons working on the estate as wage-earners. On February 7th, 1908, I counted thirty persons so employed, and on another occasion thirty-six men and youths and two women. The resident small holders with any grown-up sons living at home, are fully employed on their holdings, and the tenants of smaller lots, living in the village, work more or less on their land. Sixty cows are at the present time kept on the larger holdings, and the wives of the tenants are therefore occupied in dairy-work.

Yield of Corn Crops.—No return was made by the tenants for the year 1907, as the crops for this, the first year of occupation, would depend upon the condition of the land when taken over and the quantity and quality of the manure left by the Crown as outgoing tenants. The average yields per acre of crops grown by the twelve resident holders during the years 1908, 1909, and 1910 are as follows :—

	Wheat. Bushels.	Oats. Bushels.	Barley. Bushels.
1908..............	41	61	41
1909..............	39	60	48
1910..............	37	61	41

It will be noticed that the wheat and barley last year suffered here, as elsewhere, from the cold and sunless summer.

The average yield of the same cereals for Cambridgeshire was as follows:—

	Wheat. Bushels.	Oats. Bushels.	Barley. Bushels.
1908	34½	56¼	36
1909	34¾	55¾	42
1910	30	52¾	35¼

Census of Live Stock.—The number of cattle kept by the twelve resident holders has not reached the maximum, since additional buildings have recently been provided. On entry these tenants owned live stock as follows:—Horses 33, cattle 66, pigs 122, poultry 267. The returns are as follows:—

	Horses.	Cattle.	Pigs.	Poultry.
Live stock owned on entry, 1906 ...	33	66	122	267
„ „ „ at Michs., 1908 ...	49	171	296	521
„ „ „ „ „ 1909 ..	48	206	249	637
„ „ „ „ „ 1910 ...	46	214	332	529

An accurate census cannot conveniently be taken of the live stock kept by the tenants of the smaller holdings and allotments on the remaining one-fourth of the estate, as some of these tenants have land in addition to Crown Land. But practically all keep stock of some kind, and poultry, at their homesteads in the village, using and consuming the straw and returning the manure to the land. It is probable that the value of the produce sold, as pork, butter, poultry, and eggs, by the smaller tenants would at least equal per acre the value of the produce sold off the resident holdings.

A tenant of 4¼ acres reports sales and values of produce consumed in 1909 as follows:—

	£	s.	d.
Corn and roots	40	3	0
Pigs	20	0	0
Poultry	5	0	0
Eggs	4	0	0
Vegetables	2	10	0
Bacon consumed at home	3	0	0
	£74	13	0

A tenant of 4½ acres sold in 1909 pigs of the value of £48 6*s*., and, in addition, this tenant owned in that year two ponies, a cow, a fattening beast, a store beast, and twenty head of poultry. A tenant of two acres sold pigs of the value of £20; a tenant of a two-rood allotment sold pigs of the value of £16.

Purchase of Feeding Stuffs.—The consumption of home-grown corn on the holdings is practised and encouraged. The extent to which this is done, however, depends upon the relative prices of such corn and of foreign feeding stuffs:

hence the variation in the returns hereunder, supplied by the twelve tenants:—

	Purchased feeding stuffs. £	Sacks of home-grown corn consumed. No.
1908	753	1,502
1909	1,141	986
1910	1,191	1,214

The smaller tenants also follow largely the practice of feeding to pigs and poultry the corn grown on their allotments, feeding stuffs in addition being purchased of the local miller and at the stores. In this connection the receipts at the Co-operative Stores, Burwell, where many of the small holders trade, may be given:—

	£
1905	4,053
1906	4,247
1907	4,749
1908	4,550
1909	4,760
1910	4,803

Thus, since Michaelmas, 1906, the average takings at these Stores have increased by about £550 a year.

Purchase of New Implements.—The agricultural implements used by the small farmer and small holder are almost exclusively of home manufacture, the carts, harrows, and drags in particular being made by village wheelwrights and blacksmiths. The figures hereunder should have additional interest on that account, and indicate here, as elsewhere, the impetus given to certain village handicrafts as a result of the establishment of the small holder. Expenditure upon *new* implements by the twelve resident holders has been as follows:

	£
Expended in 1907-8	606
,, ,, 1909	171
,, ,, 1910	244
Total	1,021

Produce Consumed at Home.—In examining the economic position of the small holder and the small farmer, the fact that he lives to some extent on the produce grown on his holding will be taken into account. To test this matter the following question was addressed to the twelve tenants whose holdings are under review:—

What is the estimated value of the wheat (if any used for home-made bread), milk, butter, eggs, poultry, bacon, and vegetables which you *consumed at home* during the past year?

Eleven tenants returned the following figures respectively:—£10, £10, £12, £14, £15, £15 10*s.*, £25, £30, £40, £40, and £50: Total, £261 10*s.* Considerable difficulty was experienced by the tenants in arriving at this estimate, and the value is probably understated; as it stands, the average amount per family is just over 9*s.* per week.

Increase of Tenants' Capital.—The figures quoted above demonstrate that the capital of the tenants has appreciably increased, but it is of special interest to be able to give the views of the tenants themselves, stated in answer to the following question:—

If a valuation were now made of your unsold corn, live stock, implements, &c., can you say, approximately, the amount of the difference in the value as compared with the value of your effects on entry? In other words, by how much do you consider the total value of your belongings has increased since your entry at Michaelmas, 1906?

The returns, totalled, are as follows:—

	£
Estimated increased value at Michaelmas, 1908...	775
" " " " 1909...	1,035
" " " " 1910...	1,545

The increase in the number of live stock and the possession of new implements costing £1,021 would suggest an even larger progressive increase in the value of the tenants' property, but the tenants would be expected to take a moderate view of progress made when invited to express such progress to the landlord in terms of pounds, shillings, and pence.

Additional Buildings and Cottages.—The farm buildings on the estate are exceptionally roomy and commodious. It has been necessary, however, to provide on some of the holdings further permanent accommodation for stock, in addition to the temporary sheds and piggeries which the tenants themselves have erected. Four blocks of buildings, built of creosoted wood and roofed with slate, have just been completed, at a cost of £450. Last year the Commissioner of Crown Lands, on the request of Sir Charles Rose, built eight superior cottages, at a cost of about £400 per pair. One of the cottages is let with a small holding of 25 acres, and seven are let each with the acre of land on which the cottage is built. The rent of each allotment-homestead, [illegible]

the acre of land, is £10, the landlord paying the rates and keeping the cottages in repair. There was a keen demand for these cottages. The total cost of equipment of the estate up to the present has been £4,000, bearing interest, as additional rent, amounting to £170. Interest is charged to the lessee at the rate of 4 per cent. upon the original equipment, dating from Michaelmas, 1906, 4½ per cent. upon the new cottages, and 5 per cent. upon the substantial wooden buildings. Any deficiency in the returns upon the equipment is provided by the tenants out of the General Rent Fund.

Co-operation and Credit.—Many of the small holders and allotment holders are members of the Burwell Co-operative Society, Limited, and purchase their goods through the stores. The tenants are not at present organised in any registered societies working through committees for the acquisition of loans, the purchase of commodities, and sale of produce. The home-grown corn for feeding stuffs is ground up by the local miller, there is an artificial manure factory near the village, and a friendly farmer takes samples of corn and sells for the small holders at Cambridge market. Co-operation of a helpful kind is, however, extensively practised amongst neighbours—horses are yoked together to make a team, each holder's corn or sainfoin is carted on successive days, implements are exchanged, a hand is given with the stock, and the purchase of seed corn is often effected mutually. A petrol engine for pumping water is worked co-operatively at one block of buildings. One tenant has established a milk-round, and sells upwards of 60 gallons of milk per week in the neighbourhood. The same tenant buys the butter from his near neighbours and sells it while on his round, about 50 lb. per week being thus disposed of. At the annual horticultural show, held on the Crown Lands, prizes are given for flowers, fruit, vegetables, and the best cultivated allotments and gardens. With regard to credit, when the holdings were established a few approved tenants were short of capital. Sir Charles Rose met the situation by allowing the first half-year's rent to stand over until after harvest, and by accepting the Tenant-right Valuation payable by such tenants in instalments. On these conditions the men were able to work their holdings freely and pay their way

in other respects. In the second year these men found themselves able to pay the Lady Day rent when due (before harvest); they have increased the number of their live stock, and the amount now owing for Tenant-right is reduced to a minimum.

At the outset the suggestion to create small holdings at Burwell was much discouraged in local and district agricultural circles. Many practical men, who recognised the possibility of small holdings being made to pay in suitable districts, could not admit the probability of success in this case, while others saw insuperable difficulties in connection with apportioning the land and the Tenant-right, amounting to £2,030; most prophesied that in a few years' time the holdings would revert to two or three farms of medium size. Considerable anxiety was felt on the ground that the labourers working on the estate might suffer through lack of employment, and to meet this Sir Charles Rose paid £389 as compensation, and pensioned off two aged employés. A further objection advanced was that in the event of failure, and the area under several holdings reverting to one holding, the cost of adaptation and of new buildings would be largely wasted, while the incoming tenant might have to be compensated for entering upon a farm broken up into miscellaneous plots of land, requiring a lapse of time before he could farm on the four-course system.

The fears then expressed have been entirely falsified by the course of events extending over the four years. There are no arrears of rent, and there have been no changes of tenancy except those necessitated by the acquisition of frontage land for the new cottages. Sir Charles Rose has received 97 per cent. of the amount advanced by him to the outgoing tenant for Tenant-right, the estate is self-supporting, and a margin is available to meet the cost of small improvements and progressive equipment. Ten additional families are housed on the estate. While eighty tenants have an occupation interest in the allotments and holdings, their own labour is supplemented by hired labour equivalent to wages amounting to at least 25s. per acre over the entire estate.

and in the amounts expended on feeding stuffs and new implements, and the tenants' estimate of the increase in the value of their belongings, are alike progressive in character, and, it is believed, have not reached their limit. During the winter following upon the conversion of the Crown Lands into small holdings, the official figures showed that out-door relief in the parish of Burwell was less by £10 than during the preceding winter, and the prosperity of village shopkeepers has corresponded with other evidence of progress. The greater application of labour to the land is partly due to the substitution of manual labour for machinery, and partly to the personal interest taken in the land and the healthy spirit of emulation and enterprise shown by many of the tenants. The tenants, satisfied that their tenure is secure, and holding the land at a moderate rent, are encouraged to put their best into their work, and thus to reap the reward of their thrift and personal labour.

The following report has been made by Mr. W. T. Scruby, F.S.I., Surveyor and Valuer, of Cambridge, who was instructed to make an independent report upon the Crown Lands, with special reference to the condition of the arable land and the general appearance of the stockyards and holdings:—

"On October 4th, 1906, I valued for the incoming tenant the Tenant-right on the Crown Lands, Burwell, comprising about 917 acres, Mr. Charles Bidwell, of Ely, representing the Crown agents, who had for two years farmed the lands as one occupation under the supervision of a resident bailiff. The valuation at Michaelmas 1906 comprised a large quantity of hay, straw, manure, and fixed machinery. Although a considerable quantity of stock had been kept on the land, certain parts of the farm were then foul, and some allowance was made in the valuation on that account.

"At that time I had had some experience of allotments, but very little of small holdings; and I looked with great interest, but with some misgiving, to the future of what seemed a somewhat rash experiment. The good quantity of manure left on the farm by the Crown gave the tenants an

excellent start, but I feared they might not find capital enough to stock their holdings sufficiently to keep the land in good heart and condition. I also thought that the fact that a small holder could not regularly keep sheep was a serious drawback.

"On March 1st, 1911, I again inspected the lands, now under small holdings. Of the four intervening seasons, two had been good and two poor, that of 1910 being particularly so.

"I have to report that with reference to the 12 larger holdings, averaging about 56 acres each, they all appear to be in fair condition and reasonably clean. With two exceptions, I found the work well forward for Spring and all the Autumn-sown corn looking strong and well. The lands on the Ness portion of the Estate particularly were much cleaner than when I valued in 1906. Most of the unconsumed hay and straw was clean, and there were some good mangolds in the clamps. The implements were mostly modern and many nearly new. On most of these holdings I was surprised at the amount of live stock kept, comprising milch cows, fatting beast, young beast, calves, pigs, and poultry. The tenants seemed fairly well supplied with horses, although a few of them were too light or too old for the work. In several cases the tenants have bred useful cart foals.

"The Burwell Fen holding is especially worthy of mention from the fact that it has much improved since 1906. It was then all grass, some of which was of poor character. The present tenant has broken up part of this, has much improved the best of the pasture, and has his yards full of stock of all kinds, fat and fatting.

"The question naturally occurs: could these tenants weather the storm after two bad seasons in succession? I think the majority could now do so, because they would begin with a fair surplus, and as their families do much of the work themselves their standing expenses are considerably reduced. It seems probable that the younger of these men in course of time will work their way into positions enabling them to take farms, and leave the holdings for smaller men who might otherwise be unable to get a start in life.

of comfort about the homes which speaks well for the occupants. New cottages have been erected, the interiors of which I find to be, on the whole, commodious and convenient. Extra stock-shedding and shelters have also been provided on various holdings since my former visit. The covered stockyards are a great boon to the tenants, as they are helpful for rearing and fattening and economical for manure. The interest on the outlay for most of this extra accommodation is paid by the tenants, and they certainly need the accommodation and make good use of it.

"As to the smaller holdings, varying from 3 to 15 acres in extent, occupied by non-resident tenants, I had no opportunity of seeing what stock they kept and can only speak of the state of the land. Although in a few instances the cultivation is not good, there is in the main an absence of attempts to "work out the land and throw it up" which one often sees in such cases. A number of these holdings are let to small village tradesmen and mechanics, to whom the chance of hiring a few acres is a great accommodation and encouragement. The same remarks apply to the 32 allotments of from half an acre to one acre each. These are admirably laid out, situated close to the village, and are mostly held by labourers, for whom they were intended. None of them are neglected, and most of them appear to be in fair order.

"Among such a number of tenants the standard of management would necessarily vary. Taking the Estate as a whole, there is no deterioration in the state, or productivity, of the land; on the other hand, parts of the land have distinctly improved in condition. There is a general atmosphere of prosperity amongst the tenants, and I do not think that the proportion of indifferent cultivators is likely to be any greater, if as great, than amongst a similar number of farmers occupying from 200 to 400 acres each."

OSIER AND WILLOW CULTIVATION.

W. PAULGRAVE ELLMORE AND THOMAS OKEY.

THE aim of this and of the ensuing articles is to invite the attention of farmers, small holders, and others, to a profitable but somewhat neglected branch of agriculture, and to fill a gap in the literature on osier culture published in the United Kingdom. Except a small pamphlet in two parts by Mr. William Scaling, issued in 1872, and long since out of print, nothing worthy of the name of literature exists in this country. Among foreign works the following may be mentioned:—the "Basket Willow, by William F. Hubbard, with a chapter on Insects injurious to the Basket Willow, by F. H. Chittenden," published in the United States; the "Lehrbuch der Rationellen Korbweidenkultur," by J. A. Krahe, published in Germany; the "Oseraies Françaises," and the "Encyclopédie de l'Osier," by M. Gaston de la Barre, published in France.

That the basket-makers of the United Kingdom are increasingly dependent on imported supplies of raw material is evident from the Annual Statement of the Trade of the United Kingdom for 1909, which shows that the importation of willows and rods for basket-making were as follows:—

	1905.	1906.	1907.	1908.	1909.
	£	£	£	£	£
Germany	35,826	35,350	31,362	25,009	26,308
Netherlands	10,990	13,011	13,095	11,753	10,975
Belgium	11,447	14,933	15,307	14,818	10,643
Other foreign countries	3,771	3,769	5,694	13,111	15,129
British possessions *...	551	687	626	10,029	13,746
	62,585	67,750	66,084	74,720	76,801

There is no apparent reason why home cultivators should not meet the whole demands of the home market, and supply also the requirements of Colonial consumers, who are now served direct by Continental growers. A large farmer in Berkshire is known to one of us who, during the disastrous seasons of the 'seventies was saved from bankruptcy by the produce of his osier beds, and another small farmer in the same county gained a comfortable independence by careful cultivation of like crops.

* No osier-producing British possession is known to the writers. It would be interesting to learn the actual country of origin of these imports.

PREPARATION OF GRASS AND ARABLE LAND.

No royal method can be laid down as applicable to all conditions, for locality and soil will require the experienced agriculturist to bring his own ideas to bear on this, as on all other practical matters. It may, however, be accepted as a rule that no arable land is equal to meadow, because it usually lacks that high state of fertility which follows the breaking up of old turf. Even in the case of old turf we have found that the willow crop greatly benefits by the headlands having a good, heavy dressing of manure ploughed in. No willow crops grow so well on the outside as on the sheltered, inside portion; consequently the extra stimulus to the poorer fringe —which is exhausted by tree and hedge growth—will bring the outside more into character with the rest of the field. Buyers thoroughly acquainted with their business seldom deem it necessary to go far inside the crop, for if they find the outside portions satisfactory it will follow that the inside is almost sure to be of good quality.

Some twenty-two years ago one of us took over 40 acres of good, heavy, arable land at Thurmaston, near Leicester, and after fallowing it for one summer to clean it from twitch, &c., applied about 60 loads of ripe farm-yard manure to the acre before ploughing 12 inches deep. He then planted it the following spring with satisfactory results. The land was cropped for fifteen years, when it was taken over and cultivated by a successor, who has during the last two years grubbed it up and turned it again into corn land. In order to dispel an oft-expressed fear that land loses its value after being employed as an osier or willow bed, it may be said that in the autumn of 1909 this same land yielded eight quarters of excellent marketable wheat to the acre, and was sown again with wheat the following season, producing seven quarters to the acre.

Instead of willow-growing impoverishing land, the heavy foliage which falls each autumn materially enriches the ground, especially if men are sent on to the land in the wake of the cutters to turn the leaf under the soil for some two or three inches with a spittle or shovel. This method of treatment will be found of great service in several ways:—First, it returns to the soil its natural manure; secondly, it turns up

much dormant and other insect life, as may easily be observed by the number of the birds which follow the operations of the men; and thirdly, it leaves the ground clean for the hoers to start their work under the best possible conditions, since they have nothing but the minor growth of the spring to contend against. Further methods of cleaning will be dealt with in a subsequent section.

Cultivation.—Of the four recognised ways of breaking up grass land, double digging unquestionably produces the best results. That method, however, although showing by far the best after-returns, is a very expensive one, and is only recommended where the area is small, or where the land lies unsuitable for the plough. The following systems have been carried out with very satisfactory results:—

In the case of meadow land, a strongly and specially made plough was employed, fitted with a revolving cutting knife in front of the coulter to cut the grass about three inches deep, followed by a skimmer about five inches wide, and fitted with a 24-inch wheel for the furrow. The breast plate of the plough should be much longer and have more throw-over than that of the ordinary plough, to enable it to turn over the ridge or seam, and lay it as flat as possible, and plough the soil not less than nine inches deep. This process gives the young roots a better chance of penetrating the deeper soil below the cut of the plough; it also possesses a decided advantage over another system which will be described later on, inasmuch as the turf, which contains a considerable amount of fertilising matter, mixes with the soil, in about an equal proportion, down to the unbroken subsoil. The cost of this method works out, including the after-harrowing, at £3 4s. per acre; it needs six horses and a more than usually strong ploughman, owing to the great depth to be turned up and to the exceptional strength required to handle and turn round such a heavy plough. It is only recommended where there are no undesirable vegetable growths in the land, such as are frequently found in our English meadows in great quantities.

If growths such as burnet, docks, reed grass, pile wort, and meadow sweet are present, a double course of ploughing to break up the land is very desirable. An ordinary plough

of turf. This should be followed by the stronger plough with six stout horses, as described above, in order to break up the subsoil to a further depth of nine inches. This system, which, together with the cost of harrowing, works out at about £3 18*s*. per acre, enables the turf to be laid flat at the bottom of the furrow, and as the head of the burnet is shielded in the turf, it is largely killed. Observant agriculturists know full well how difficult this herb is to eradicate, and will not be surprised to see odd patches of it appear again the following summer. When that is the case, the most effectual treatment is to have the patches forked out. Hoeing tends to propagate rather than kill, and if the men employed use reasonable care the roots of the willows are not damaged by this process. After hoeing fifteen acres six or eight times over in one season, it was found necessary to resort to the forking process about August, leaving the burnet between the rows, where it entirely perished by the next spring.

In preparing for osiers at Loughborough in 1910 it was found that the use of a steam cultivator, as soon as the grass was carried at the end of June, was the most efficacious way of getting rid of large masses of burnet. The field was dragged both ways to a depth of about four inches; then the land was left exposed to the sun for several weeks, and the same double operation repeated for the purpose of further breaking up the turf. After five weeks' longer exposure the process was repeated, the drag going twice over the ground on each occasion. The last operation completely broke up the whole of the turf, the root portion of the burnet by this time being withered, although quite alive where embedded in the turf; thus the head part of the plant was exposed to the action of the sun in the months of September and October, and all the undesirable growths destroyed. The land was then ploughed to an inclusive depth of ten inches, six horses being engaged for this work. Left thus until the first week of the following February, the ground was found to be in excellent workable condition, and was accordingly harrowed over twice; the soil, being broken down like an ordinary garden soil, was

LOCAL CONDITIONS, SUPPLY OF LABOUR, &C.

Willow growing lends itself to great divergence of planting, and the cultivator must be largely governed in his choice of the kinds of willows by the class of material required by the manufacturers of the district, as well as the natural characteristics of the soils. There are few soils that willows of one kind or another will not do reasonably well on, and where there is a loam of from six to eight inches, changing to a stiff marl or clay subsoil, there need be little doubt as to the results being satisfactory. An ideal ground for willows should be arranged so that during a dry summer it can be irrigated at will. During the months of May to August almost every one of the best fine-top kinds will do better if aided in this way. At the same time, it is most necessary that the ground should have excellent drainage facilities, to avoid injury of the crop owing to excess of wet during the naturally dormant months of the winter season. The life of the heads, the quality of material, and the yield are very largely affected by wet and cold.

The botanical species known as *Salix triandra* embraces many of the choicest fine-top varieties. *Salix purpurea* is a bitter species, which rabbits and cattle will seldom touch unless under great stress of hunger. These, and several hybrids, will do best under damp and moderately heavy soil conditions. Other varieties, chiefly those of the *Salix viminalis* species—the true osier—will thrive under much drier conditions. This last comprises a very large number of varieties which differ greatly in their natural habits of growth.

It is inadvisable to attempt growing willows in large quantities where there is any scarcity of labour. No branch of agriculture needs so much expenditure for labour per acre as that of willow-growing if the ground is to be efficiently cultivated; and the produce properly sorted, peeled, and prepared for the different classes of willow-workers. The method of allowing the peelers to sort the crop into two sizes during the process of peeling, by no means meets the requirements of manufacturers, who are prepared to pay an additional price to secure exactly what their class of productions calls for, rather than be compelled to purchase such

At the same time there is no branch of agriculture which will give, under suitable conditions, a better return upon capital. In many districts of England willows are in considerable demand unpeeled, either green, or brown—*i.e.*, dried. The difficulty of obtaining an abundant supply of labour is in these districts surmounted, because the crops are then cut in the winter—usually from December to March—when work is slack. But conditions are considerably altered when the willows are to be peeled for buff, which operation is generally carried on by women in the winter months, or for white, in the months of May, June, and July, just at the time when every branch of agriculture is crying aloud for more hands. Fuller details as to the best methods of carrying out these operations will be given in a later article.

The grower should, therefore, make himself familiar with the class of willows in demand in the district he proposes to supply. Otherwise, he may plant sorts for which there is little or no local demand, and reduce his profits by excessive freight charges to the districts where the demand for his produce exists. The kinds which are best adapted for selling with the bark on are the full-topped *Salix viminalis* and its many varieties, some of which are rapid growers, and consequently more or less pithy and tender; other varieties are of a medium quality, and yet others are of a superior grade. Certain of the largest growing kinds of *S. triandra* also command a very ready sale, and realise big prices when sold unpeeled. A grower should, therefore, be very careful when planting to ensure that true strains are supplied to him. This caution is necessary because many growers who supply plants are totally indifferent as to classification, and will send anything so long as it is a reliable willow. An expert's fees are amply recuperated if planting on any large scale is contemplated; failure in this essential precaution will only lead to disappointment.

The idea prevalent amongst most farmers that any piece of land upon which they cannot produce any other crop will do for willow growing is quite erroneous and is responsible for many failures. The most amazing delusions prevail on this point. It has lately been stated by a writer on basket-work that the twigs of which baskets are composed will

grow on otherwise worthless land, and practically in a wild state. If the best financial results are to be achieved, a good quality of ground is imperative. The plot, too, should be easily accessible, so as to save the expense of long carting journeys in the winter time, and the land should also be in the highest state of fertility and kept quite free from weeds. Weeds, if allowed to accumulate, not only affect the growth of the willows, but also the quality of the material. Especially is this the case with the finest and choicest kinds of willows when one year old. Any saving effected by sparing the hoe is more than lost when the crop is to be used for white or buff peeling, because the grasses have then to be sorted out by hand—a tedious and cold operation involving tying up twice. The net result would be a saving of 20*s*. in the summer, and an expenditure of 25*s*. in the winter.

WEEDS IN RELATION TO SOILS.

W. E. BRENCHLEY, B.Sc., F.L.S.
Rothamsted Experimental Station.

DURING the last fifty years the question of the relationship between the soil and the plants which grow upon it has been well to the fore, and it is now obvious that the character and composition of the soil have a very definite influence in determining the species of plants which will grow and flourish in a particular locality. Much detailed work has been carried out in connection with grass land, and the effect of different soils and manures in encouraging or inhibiting the growth of various plants has been investigated in great detail.

While much information is thus available with regard to grass land vegetation, the reverse is true in the case of weeds on arable land. Impressions and observations have been recorded by many writers, but the results have never been so classified as to give the information required in a systematic form.

This being the case, an attempt was made in the spring and summer of 1910 to devise some means of ascertaining how far the weeds of arable land are characteristically connected

with particular soils and crops, and how far they are independent of either soil or crop. As a beginning it was decided to limit the work chiefly to the soils overlying the well-defined geological series of rocks between Harpenden and Bedford, as within about twenty miles the Chalk, Gault, Lower Greensand and Oxford Clay appear in well marked succession.

The working plan adopted was that of visiting as many farms as possible during the season (extending from May to August), and detailing the nature of the soil, the crop grown, and every species of weed found in each individual field. So far as was practicable the relative prevalence of the weeds was noted in each case, falling under five headings:—

(1) Dominant.
(2) Sub-dominant.
(3) Very generally distributed.
(4) Occasional.
(5) Scarce or rare.

Much information was frequently obtained from the landowners or farmers as to the soil, rotation of crops, manuring, and troublesome weeds.

The data obtained in the field have been tabulated and analysed. The results are essentially preliminary and to some extent tentative in nature, as the year's work was of necessity confined to a very limited area, and more extended observations, embracing soils in different localities and under varying climatic conditions, are necessary before any definite conclusions can be drawn as to the relations existing between the weed, soil, and crop.

During the season's survey about 150 fields were visited, yielding 107 species of weeds, representing 74 genera; of these, 30 species representing 28 genera were each seen once only. In noting the weeds only those plants growing actually among the crops were taken into consideration, those occurring on the banks and hedgerows being ignored.

The classification of the soil was of necessity somewhat haphazard, as no mechanical analyses were undertaken during this preliminary survey, an arbitrary opinion on the nature of the soil in each case being formed on the field, and frequently modified or corroborated by the verdict of the

farmer. In the absence of mechanical analyses it is very difficult to distinguish between a true clay and a clayey or heavy loam, a sand and a very light loam, &c., but experience enables one to gauge the texture of the soil sufficiently for the practical purpose of the investigation.

An examination of the tabulated and classified lists of results reveals the fact that while some weeds are generally distributed, occurring on all types of soil indiscriminately, other plants are definitely symptomatic, only occurring in certain habitats, being absent from all others. (N.B.—While a weed may be said to be absent from any particular soil, still it is possible for it to occur in that very habitat as a stray, though very rarely or occasionally.)

A.—*Clay and Heavy Loam.*—The weeds on the heavy lands were relatively few as regards the number of species, especially in comparison with those on light and sandy soils, though the quantity of weeds was equally abundant. It was found that with the solitary exception of the Field Mint (*Mentha arvensis*), all the common clay weeds occurred on soils derived from both the Gault and Oxford Clay. *Mentha arvensis* was only found on the Gault and is very local, and it is quite possible that further search might discover it on the Oxford Clay as well.

Red Bartsia (*Bartsia Odontites*) and Field Mint were the only two weeds confined to clay lands, but several were very characteristic of clay soils, though they sometimes occurred elsewhere. The most prominent of these were Charlock (*Brassica Sinapis*), Fat Hen (*Chenopodium album*), Mayweed (*Matricaria inodora*), Knot-grass, Black Bindweed, Corn Buttercup (*Ranunculus arvensis*), and Ivy-leaved Speedwell.

B.—*Chalk.*—This includes both the chalk proper and the heavy chalk marl underlying it. The flora on these soils is somewhat sharply marked out, in that several plants which are otherwise generally distributed, are totally absent, because they are calcifuges, *i.e.*, plants which cannot live on a chalky soil. A few plants are symptomatic, their presence indicating with practical certainty the calcareous nature of the soil, *viz.*, Brome-grass, Small Crane's-bill (*Geranium*

pusillum), Field Scabious, and Wild Madder (*Sherardia arvensis*).

White Mustard (*Brassica alba*), Fumitory. and Dove's-foot Crane's-bill (*Geranium molle*), are very characteristic of chalky soil, but occur on other types of land as well.

Besides these, the following are also very common—Bent-grass (*Agrostis stolonifera*),Parsley Break-stone (*Alchemilla arvensis*), White Campion (*Lychnis vespertina*), Rough-stalked Meadow-grass, and Wild Pansy.

C.—*Light Lands.*—The striking feature about the weed flora of very light arable lands is the large number of species that are represented. Corn Marigold (*Chrysanthemum segetum*), Sheep's Sorrel, and Spurrey are confined to sand, and are unfailingly symptomatic, being probably dependent upon acid soil conditions: of the many other weeds closely associated with light soils it must suffice to name only a few: Cudweed, Mayweed (*Matricaria Chamomilla*), Poppies, Broad-leaved Dock, Red Dead-nettle, Fat Hen, Knot-grass, "Couch" (*Triticum repens*), and Wild Pansy.

Besides those weeds which are associated with certain particular types of soil, there are several which are quite general in distribution, occurring anywhere, and which may be dominant on any soil. Among these are some of the most familiar of all weeds, such as Shepherd's Purse, Mouse-ear Chickweed, Bindweed (*Convolvulus arvensis*), Horsetail (*Equisetum arvense*), Goose-grass, Buttercup, Dock, Groundsel, Dandelion, Coltsfoot, Thistles.

Relationship between Weeds and Certain Crops.—While the nature of the soil plays such an important part in determining the local weed flora, the character of the crop, generally speaking, is a matter of indifference. The one exception to this rule is in the case of seed crops—clover, lucerne, sainfoin, and trefoil. Many weeds, though they are to be found with every other crop, are entirely absent or very rare with "seeds." This may be due to the difference in habit, as the Leguminous plants cover the ground so closely with such a dense mass of herbage, that probably many weeds are choked out. One or two species, particularly species of Geranium, Mouse-ear Chickweed, and Wild Madder, are

almost entirely confined to such crops, and it is possible that these weeds are not indigenous, but are introduced with the seeds sown.

A very few species are practically confined to cereal crops: Mayweed (*Anthemis Cotula*), Charlock and White Mustard, Hardheads (*Centaurea nigra*), and Annual Meadow-grass.

Of the weeds that are absent or very rare in seed crops, the best known are Scarlet Pimpernel, Fat Hen, Horsetail, Goose-grass, Wild Mint, Knot-grass, Black Bindweed, Corn Buttercup, Shepherd's Needle, Spurrey, Couch, Coltsfoot, Speedwell.

The variety of crop does not appear greatly to influence the weed flora, but the cultivation frequently affects the prevalence of certain weeds the next year.

Couch or Twitch.—Care was taken to discover the various species of plants designated as "Twitch" or "Couch" in the different localities. Any grass which runs along the surface of the soil or covers it to any great extent is apparently so called, the following species being included under this heading:—

Bent-grass (*Agrostis stolonifera*).

Slender Foxtail (*Alopecurus agrestis*).

Perennial Rye-grass (*Lolium perenne*).

Cat's-tail (*Phleum pratense*, var. *stolonifera*).

Annual Meadow-grass (*Poa annua*).

Couch (*Triticum repens*).

It has been suggested that it would be advisable to reserve the name "Couch," which is used somewhat indiscriminately, for *Triticum repens* only, designating as "Twitch" all other grass weeds of the characteristic habit of growth.

Coltsfoot.—Special investigations were made to determine whether Coltsfoot and Horsetail (*Equisetum*), which so often occur in company, are in any way characteristic of some particular quality of soil. Samples of the soils were tested to determine their acidity or alkalinity, with the result that it was found that both the species of plants under consideration occurred on either acid or alkaline soils indiscriminately, and so could not be regarded as indicative or symptomatic.

Spurrey.—"Spurrey" (*Spergula arvensis*), on the other

		Clay and Heavy Soil.	Chalk.	Sand and Light Loam.
Anthemis Cotula	Mayweed	Infrequent	Infrequent	Infrequent
Bartsia Odontites	Red Bartsia	Characteristic...	———	Scarce
Brassica alba	White Mustard	———	Characteristic... ...	Frequent
,, *Sinapis*	Charlock...	Frequent...	Frequent...	Occasional
Capsella Bursa-Pastoris	Shepherd's Purse	Frequent...	Frequent...	Occasional
Carduus sp.	Thistles	Frequent...	Frequent...	Frequent
Chenopodium album	Fat Hen	Occasional	———	Frequent
Chrysanthemum segetum	Corn Marigold	———	———	Symptomatic
Convolvulus arvensis	Bindweed	Frequent...	Frequent...	Frequent
Equisetum arvense	Horsetail...	Frequent...	Frequent...	Frequent
Fumaria officinalis	Fumitory...	———	Characteristic... ...	Occasional
Galium Aparine	Goose-grass	Frequent...	Frequent...	Frequent
Geranium sp.	Wild Geranium	Generally distributed ...	Occasional	Occasional
Matricaria Chamomilla	Mayweed	One record only	———	Occasional
,, *inodora*	Mayweed	Characteristic...	Rarely seen	Frequent
Mentha arvensis	Field Mint	Characteristic...	———	Occasional
Myosotis arvensis	Field Forget-me-not ...	Frequent...	Frequent...	Frequent
Papaver sp.	Poppy	———	Occasional	Frequent
Polygonum Aviculare...	Knot-grass	Occasional	———	Frequent
,, *Convolvulus*	Black Bindweed	Frequent...	———	Frequent
,, *Persicaria*...	Spotted Persicaria	Occasional	———	Occasional (and on "Black land")
Ranunculus arvensis	Corn Buttercup	Occasional	Very occasional ...	Occasional (not on sand)
,, *acris*	Buttercup	———	Very occasional ...	Occasional
Rumex Acetosella	Sheep's Sorrel	———	———	Symptomatic
,, *crispus*	Common Dock	Frequent...	Frequent...	Frequent
Senecio vulgaris	Groundsel	Frequent...	Frequent...	Frequent
Sherardia arvensis	Field Madder...	Frequent...	Symptomatic	Frequent
Silene Cucubalus...	Bladder Campion	———	Characteristic... ...	Very occasional
Spergula arvensis	Spurrey	———	———	Symptomatic
Stellaria media	Chickweed	Frequent...	Frequent...	Frequent
Tussilago Farfara	Coltsfoot...	Frequent...	Frequent...	Frequent
Veronica agrestis...	Field Speedwell	Frequent...	Frequent...	Frequent
,, *hederæfolia*	Ivy-leaved Speedwell ...	Occasional	Scarce	———
Viola tricolor	Wild Pansy	———	Occasional	Frequent

hand, is very symptomatic of acid soils, and it often disappears entirely where lime is applied, reducing the acidity. Lime also kills out Mayweed in many cases.

Mayweed.—"Mayweed" (*Matricaria* sp. and *Anthemis* sp.) seems to be very impatient of competition. If the crop is in any way heavy little or no Mayweed is to be found among it, though it occurs in enormous quantities round the edge of the fields, along lines of drainage, and wherever there may be a clearing in the crop.

Fumitory (*Fumaria officinalis*).—This weed does not generally occur in any great abundance, but occasionally it is so prevalent on chalk that it is necessary to hand cultivate to get rid of it in order to save the crop. This is notably the case in the Maiden's Bower, an old Roman encampment near Dunstable.

Wild Onion (*Allium vineale*).—This weed was only met with in one locality on the very heaviest of clay land. It reproduces itself by offsets, bulbils and seeds, and its vitality is so great that no known method of cultivation seems competent to eradicate it.

A table is given on p. 23 showing the relative occurrence of some of the more common weeds on the different types of soil. A line, thus ———, indicates that a weed is either entirely absent on any particular soil, or else that it is exceedingly rare in that situation.

NOTES ON THE POLLINATION OF FRUIT.

CECIL H. HOOPER, M.R.A.C.

DURING the last twenty years, the study of the pollination of fruit blossoms has been shown to be of economic and commercial importance. Among the questions investigated have been the value of insects, especially bees, as agents in pollination, the action of pollination in preventing injury to blossoms by frost, and the effect of self- and cross-pollination in the case of different varieties. The following notes give some information in regard to different fruits as to the time of blossoming and other points of interest in connection with these questions.

Nuts.—The cob and filbert nuts are the earliest of the fruits to blossom the catkins usually shedding their pollen during

February. During the past mild winter in Herefordshire both catkins and female flowers were open early in January. As is the case with other wind-fertilised plants the pollen is very abundant, and is dust-like, spherical in shape, with triangular facets.

Some trees produce few catkins, and in large nut plantations it is a frequent practice to plant here and there a tree of "Cosford" cob, which is a variety that carries a great number of catkins, and is therefore valuable in supplying pollen.

A plentiful supply of pollen is also necessary in walnut growing, while in the almond orchards of California a special variety of almond is interspersed which has been found to be an excellent pollen producer.

Gooseberries.—Gooseberries usually set their fruit well unless injured by frost, but are dependent on insects to carry pollen from flower to flower, as without their visits the pollen of a flower is not transferred to the stigma, and unless thus fertilised the blossom or young fruit sooner or later falls off. Experiments showing the value of bees in this way were described in this JOURNAL (March, 1911, p. 974). Bees and other insects were excluded from certain bushes of gooseberry and red and black currants by placing muslin hoods over the bushes. The result was that the bushes only produced a few dwarf fruits in each case, whilst the gooseberry and currant bushes around produced splendid crops.

Gooseberries are in flower in Kent during nearly a month, though the duration of a single flower is much less, the flowers at the tips of the shoots being the last to open. The pollen of the gooseberry is globular and viscid. Ewart says of the gooseberry that it commences to shed its pollen slightly before the stigma is ready to receive it, but that the stigma is ready before the anthers have shed all their pollen.

Five varieties of gooseberry were tested by Mr. W. O. Backhouse, of the John-Innes Horticultural Institution, and were all found to be perfectly self-sterile; in order to set the fruit it was necessary to transfer the pollen from the anthers to the stigma. After the anther has dehisced, the pollen remains in a compact mass, and there is apparently no mechanism to cause self-fertilisation.

Red Currants.—The red currant from first to last remains

in flower about a month in Kent, its flowers opening somewhat irregularly compared with the gooseberry or black currant. The anthers and pistil appear to come to maturity simultaneously; the pollen, however, seems to be shed during only a short period compared with the length of time the flower is open; the pollen is globular and viscid, like that of the gooseberry.

Black Currants.—The black currant only commences to flower when the leaves are fully expanded. Three years' observations in Kent tend to show that they are in flower somewhat over a month from first to last. The anthers and pistil come to maturity simultaneously. The pollen of the black currant is plentiful and spherical in shape, resembling that of the gooseberry and red currant, but is even more adhesive, clinging together in a mass. The flowers are visited plentifully by hive and humble bees, the latter working later into the evening and in less attractive weather than the hive bees.

Plums.—The average length of time for a variety to be in flower (from three years' record in Kent) is nineteen days, being in full bloom between the seventh and eighth day after commencing to flower; the duration of a single individual flower seems to be about six days between opening and all petals having fallen. According to Hermann Müller, the anthers and stigma mature simultaneously. The pollen grains of plum, apple, pear, strawberry, and raspberry are very similar under the microscope, resembling in shape a grain of wheat or a date stone.

In plums, apples, and pears, a point of much importance needs further investigation, namely, that whilst some varieties will set fruit with their own pollen (whether from the same flower, the same tree, or another tree of the same variety), these varieties being called "self-fertile," there are other "self-sterile" varieties that will not set fruit with their own pollen, but require pollen from another variety to be transferred to their stigmas in order to set fruit, the setting of fruit being almost absolutely dependent on the ovules being fertilised and becoming seeds.

Experiments conducted by Mr. Backhouse with plums in 1910 showed that plums are on the whole "self-fertile," but that hybrids tend to be completely sterile. Thus "Rivers'

Early Prolific" appeared to set fruit with its own pollen with the greatest difficulty, only nine plums setting out of as many thousand flowers, whereas "Victoria" proved completely self-fertile. The Histon Apricot plum, the Blue Bullace and Sloe, were all found to be self-fertile. The "old greengage" showed itself self-sterile, but when dusted with the pollen of "Early Rivers'" it set plentifully; in like manner the pollen of the "greengage" on the "Early Rivers'" gave a good crop.

As a practical example of this, a case may be mentioned where it was found that "Rivers' Early Prolific" and "Black Diamond," if planted in large blocks fruited badly, fruiting chiefly on the outsides of the plantation, where they adjoined plum trees of mixed varieties. In another case, a block of 20 acres of "Victoria" plums were practically a failure until a number of trees were taken out and other varieties planted in their place.

Cherries.—The different varieties of cherries appear to be in flower about twenty-two days each, and to be in full flower about the seventh or eighth day after commencing to flower. In most cherries the anthers and stigma mature at the same time. Cherry blossoms attract bees by their scent as well as by their nectar and white petals, and it is believed that bees are of great importance in the setting of cherries. The "Black Tartarian" appears to be an example of a "self-sterile" cherry.

Pears.—Experiments have shown that two-thirds at least of the different varieties of pear are "self-sterile," that is, the seeds and fruit do not mature when pollinated with pollen of the same variety of pear. Waite found that out of 36 varieties tested, 22 were "self-sterile," and although a few varieties of pear were quite productive with their own pollen, yet even with these self-pollination seemed less certain than cross-pollination. Among the varieties found more or less self-fertile in the U.S.A. were Duchesse d'Angoulême, Beurré Bosc, Beurré Diel, Doyenné d'Alençon, Flemish Beauty, and White Doyenné. Chittenden, in Essex, found "Durondeau" and "Conference" to be the only varieties out of sixteen sorts that set fruit under conditions in which cross-pollination was prevented; the other varieties set fruit only when cross-pollination was possible. "Pitmaston Duchess" is another variety that, in my experience, requires cross-pollination.

Apples.—Apples are in flower on an average about eighteen days, coming into full bloom about the seventh day; the stigmas mature before the anthers. Practical fruit growers have observed that, like pears, certain varieties planted in large blocks do not fruit well, and numerous examples of this have been brought to my notice from time to time. Mr. Chittenden points out that fruits set with pollen of the same variety seldom contain fertile seeds, and are therefore not botanically self-fertile.

In 1902 and 1903, in Essex, Mr. Chittenden tested 24 varieties of apples, and the only varieties he found set fruit with their own pollen were "Gladstone," "Stirling Castle," and "King of the Pippins." In 1907 and 1908 Messrs. C. T. Lewis and C. C. Vincent tested in the same way 87 varieties at Corvallis Experiment Station, Oregon, with the result that they found 59 were "self-sterile," 13 partially fertile, and 15 set their fruit well with their own pollen; included among the last were "Keswick Codlin," "Duchess of Oldenburgh," and "Washington."

Strawberries.—The varieties of strawberries generally grown in England appear to set fruit well with pollen of the same variety; the fruit, however, sets best if the flowering period is sunny, somewhat dry, moderately warm and calm; these conditions are the most favourable to the pollen, and also to the working of the bees among the blossoms. Rain is apt to wash away the pollen, and also to make it impotent, as pollen grains standing long in water swell and burst.

The late Professor F. Cheshire found that the tendency of plants with large blossoms was to become staminate and not good fruit bearers, but to produce runners plentifully, whilst the small flowers were more pistillate, producing large fruit but few runners; but it was from the latter that the runners should be selected.

In both strawberries and raspberries the stigmas are receptive before the anthers have begun to dehisce.

Greater knowledge of the pollination of our hardy fruits is required, and at the present time it is hardly possible to say more than that it is inadvisable to plant large areas of fruit trees all of one variety. Further investigation might advantageously be made to ascertain which varieties are most suitable for planting together, but it is clear that in the

[*Designed and made by Messrs. Spink and Son, Ltd. of* 17-18 *Piccadilly, London, W.*]

THE KING'S CHAMPION CHALLENGE CUP

For the best Premium Stallion exhibited at the Show of Thoroughbred Stallions held under the auspices of the Board of Agriculture and Fisheries.

Presented by KING GEORGE V., 1911.

absence of precise knowledge a mixture of several sorts affords more opportunity for cross-pollination. It may also be advisable to know the period of flowering of the different varieties. The importance of keeping bees should be more generally realised by fruit-growers.

Award of the King's Challenge Cup for the Best Premium Stallion.

The functions of the Royal Commission on Horse-breeding having been transferred to the Board of Agriculture and Fisheries, the annual show of thoroughbred stallions was, for the first time, held this year on the 7th March and two following days by the Board in conjunction with the Hunters' Improvement Society at the Royal Agricultural Hall, Islington.

His Majesty the King offered a challenge cup, to be held for one year, for the best stallion in the show to which a premium was awarded, and the Board offered fifty premiums of an average value of £150, and a gold medal to the owner of the winner of the King's cup. Illustrations of the King's cup and of the Board's medal are given herewith.

One hundred and fifteen stallions were entered for exhibition, three were withdrawn, and nineteen failed to pass the veterinary examination, which was conducted by Professor J. Macqueen, F.R.C.V.S., Messrs. J. Kerr Calderwood, M.R.C.V.S., E. Lawrence, M.R.C.V.S., and C. H. Sheather, F.R.C.V.S.

The judges were the Earl of Orkney, Sir Gilbert Greenall, Bart., and Mr. E. P. Rawnsley, M.F.H., and they awarded the King's cup to "Berrill," the property of Mr. Henry A. Cholmondeley, of Sledmere, York, the reserve stallion being "Drummond's Pride," owned by Mr. John Drage, of Chapel Brampton, Northampton.

H.R.H. the Duke of Connaught attended the show on the 8th March and presented the King's cup and the Board's gold medal.

Full particulars as to the names and location of the King's premium stallions, of their owners, and the members of the District Committees appointed to supervise their service arrangements for the season, are given on p. 62.

Inquiry into Methods of Sampling Milk.

The Board have received from the Principal Chemist of the Government Laboratories the following Report on the examination of samples of milk taken by an Inspector of the Board of Agriculture and Fisheries in connection with an inquiry into methods of sampling milk conducted during June and July, 1910.

The object of the inquiry was to examine the efficacy of various methods of taking samples of milk from churns which had arrived by rail from the country. Advantage was also taken of the opportunity to ascertain the character of the milk supplied to the metropolis. In this connection it was necessary to ensure that the milk received and sampled at the railway terminus had not been tampered with either at the farm or *en route*. The operations of milking and cooling were therefore carried out under the observation of the Inspector, who sealed the churns and saw them entrained. The Inspector also received the churns at the various termini and personally took all the samples.

The following methods of sampling * were examined :—

1. *Dipper Method.*—Agitation of the milk in the churn with a dipper prior to withdrawing a sample.

2. *Plunger Method.*—Agitation of the milk in the churn with a plunger prior to withdrawing a sample.

3. *Pouring Method.*—Pouring the milk into an empty churn and back again three times prior to withdrawing a sample.

4. *Tube Method.*—Drawing a sample by means of a glass tube.

5. In addition to the samples taken by these methods, five samples of milk were taken with a dipper without stirring the milk.

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* The sampling implements used in the experiments were as follows :—

Plunger, consisting of a circular metal base $6\frac{3}{4}$ inches in diameter, which contained eight holes of $\frac{1}{2}$ inch diameter. To the centre of the base was screwed a metal handle $2\frac{1}{2}$ feet long in two sections.

Dipper, consisting of a vessel 3 inches in diameter and $3\frac{1}{4}$ inches deep, to which was attached a handle 6 inches long. Capacity of vessel, half a pint.

The *Glass Tube* was 3 feet long and $\frac{7}{16}$ths of an inch internal diameter. One end was slightly drawn out for convenience in transferring the milk from the tube to the sample bottle. In taking a sample the tube was slowly lowered (pointed end uppermost) to the bottom of the churn. When the milk had reached its level in the tube, the upper end was closed with a finger and the tube withdrawn. It was then inverted

GOLD MEDAL

Presented by the Board of Agriculture and Fisheries to the Winner of the King's Champion Cup.

(This medal was designed and made by Mr. Allan G. Wyon, 2 Langham Chambers, W.)

In order to ascertain whether the sampling had been effective, it was necessary to examine a sample of milk taken after such agitation as would ensure thorough mixing of the contents of the churn.

The following samples were therefore taken :—

1. *Dipper Method.*—The milk was agitated for one minute as thoroughly as possible by stirring with a dipper six times right to left, six times left to right, and dipping milk six times from the churn and pouring it back. Two samples were then taken (*a*) with dipper, (*b*) with jug.

The milk was next agitated with a plunger and transferred to an empty churn and back again six times. Two further samples were then taken (*a*) with dipper, (*b*) with jug.

2. *Plunger Method.*—The disc of the plunger was pushed to the bottom of the churn and drawn up to the surface six times as rapidly as possible. Two samples were then taken (*a*) with dipper, (*b*) with jug.

The milk in the churn was then poured into an empty churn and back again six times, and two further samples taken (*a*) with dipper, (*b*) with jug.

3. *Pouring Method.*—The contents of the churn were poured into an empty churn and back again three times. Two samples were then taken (*a*) with dipper, (*b*) with jug.

The milk in the churn was next agitated with a plunger and poured into an empty churn and back again three times, when two more samples were taken (*a*) with dipper, (*b*) with jug.

4. *Tube Method.*—As the drawing of a sample with a glass tube would not seriously disturb the milk in the churn, a sample was taken with a tube from each churn, previous to sampling by any of the other methods.

In the case of five churns, after taking the sample with a tube, a second sample was taken with a dipper without stirring the milk.

Fifteen churns of milk were examined, representing milk from thirteen different herds; five samples each were taken from ten churns, and six samples from each of the remaining five churns.

Table A (p. 32) gives in parallel columns the percentage of fat in the sample taken with a dipper compared with that in the corresponding sample taken with a jug after a particular mixing

The difference between the (*a*) and (*b*) samples in any particular case is only slight. It will, therefore, be convenient for purposes of comparison to consider the average results of these samples as representing the composition of the milk. It will also be convenient, in order to avoid confusion, to describe the final sample from each churn (that is, the sample

TABLE A.

Sample taken from a Churn with a dipper after mixing or pouring.	Corresponding Sample taken from Churn with a jug.	Sample taken from a Churn with a dipper after mixing or pouring.	Corresponding Sample taken from Churn with a jug.
Percentage of Fat.	*Percentage of Fat.*	*Percentage of Fat.*	*Percentage of Fat.*
4·52	4·56	4·30	4·36
4·47	4·62	4·30	4·32
7·43	7·52	4·33	4·32
4·28	4·27	4·34	4·32
6·67	6·83	3·91	3·91
4·18	4·30	3·83	3·76
3·93	3·97	3·57	3·60
3·95	3·91	3·41	3·46
3·93	3·92	3·76	3·73
3·87	3·89	3·68	3·70

taken after agitation of the milk and transferring it six times) as the *Control* sample.

The following tables are compiled on this basis:—

I. *Dipper Method.*—Percentage composition of sample taken after mixing with a dipper compared with that of the control sample:—

After Dipper Mixing.		*Control.*	
Fat.	*Non-fatty Solids.*	*Fat.*	*Non-fatty Solids.*
4·54	8·73	4·55	8·75
7·47	8·58	4·28	8·88
6·75	8·14	4·24	8·41
3·95	8·46	3·93	8·46
3·93	8·99	3·88	9·07

In two cases the sample contains considerably more fat than the control sample, indicating that the cream on the surface of the milk was not thoroughly mixed with the milk by stirring with the dipper. In the remaining churns there is little difference between the two samples.

II. *Plunger Method.*—Percentage composition of sample taken after mixing with a plunger compared with that of the control sample:—

After Plunger Mixing.		*Control.*	
Fat.	*Non-fatty Solids.*	*Fat.*	*Non-fatty Solids.*
4·33	9·07	4·31	9·16
4·3[illegible]	8·88	4·33	8·87
[illegible]	8·61	[illegible]	[illegible]

There is no practical difference in the results in the first two cases. In the other three churns, mixing with the plunger has left the upper portion of the milk slightly richer in cream than it is after efficient mixing.

III. *Pouring Method.*—Percentage composition of sample taken after pouring into an empty churn and back again three times compared with that of the control sample :—

After Three Pourings.		*Control.*	
Fat.	*Non-fatty Solids.*	*Fat.*	*Non-fatty Solids.*
5·90	9·41	5·89	9·41
4·30	9·12	4·24	9·22
3·86	8·58	3·84	8·59
3·26	9·00	3·23	9·09
3·83	9·16	3·81	9·19

There is no practical difference in any of these cases.

IV. *Tube Method.*—Percentage composition of sample taken with a tube compared with that of the control sample :—

Tube.		*Control.*	
Fat.	*Non-fatty Solids.*	*Fat.*	*Non-fatty Solids.*
4·39	8·83	4·55	8·75
5·69	8·69	4·28	8·88
5·36	8·35	4·24	8·41
3·86	8·54	3·93	8·46
3·91	8·9[illegible]	3·88	9·07
3·98	9·08	4·31	9·16
6·85	8·62	4·33	8·87
5·22	8·55	3·80	8·71
3·79	8·58	3·44	8·74
3·99	9·09	3·69	9·23
6·85	9·29	5·89	9·41
5·43	9·11	4·24	9·22
4·96	8·49	3·84	8·59
3·52	8·91	3·23	9·09
4·30	9·08	3·81	9·19

The composition of the tube samples is widely different in most cases from that of the corresponding control samples, and the results point conclusively to the ineffectiveness of this method of sampling.

V. Percentage composition of sample taken with a dipper without previous stirring, compared with that of the control sample :—

Dipper.		*Control.*	
Fat.	*Non-fatty Solids.*	*Fat.*	*Non-fatty Solids.*
11·30	8·66	5·89	9·41
11·93	8·25	4·24	9·22
8·06	8·09	3·84	8·59
4·63	8·87	3·23	9·09
4·82	9·15	3·81	9·19

These results show that the milk must be mixed before a

The following conclusions as to the efficacy of the various methods of sampling are to be drawn from the results of the experiments:—

(*a*) *The tube method is ineffective.* The failure is in part due to the fact that the section taken with a glass tube from the bulk of milk in a churn whose sides are not parallel does not represent the relative proportions of milk and creamy layer in the churn.

(*b*) The dipper method fails to ensure in every case efficient mixing. The good results given in three instances out of the five examined may arise either from the churns not having been in a state of rest for any lengthened period prior to sampling, or from the dipper used for stirring reaching nearer to the bottom of a partially filled churn. It is not to be expected, however, unless the dipper reaches the bottom of the milk and has an up-and-down motion, that the mixing can be really effective.

(*c*) The plunger method gives results only slightly inferior to those obtained by the thorough method adopted in taking the control sample. Possibly with a little more agitation this method might prove equally effective.

(*d*) The pouring method, that is, pouring the milk from the churn to an empty churn and back again three times, mixes the milk effectively.

With respect to the evidence as to the character of the milk supplies furnished by these results, attention may be drawn to the following points:—

(*a*) The range of fat in the samples is 3·23 to 4·54 per cent., excluding the Jersey milk, which contained 5·89 per cent. All the samples, therefore, exceed the 3 per cent. presumptive limit of milk fat referred to in the Sale of Milk Regulations, 1901; the average being 3·97 per cent., excluding the Jersey sample, or 4·10 including it.

(*b*) The non-fatty solids in the samples range from 8·41 to 9·23 per cent., or 9·41 including the Jersey sample, the average being 8·88 excluding the Jersey sample, or 8·92 including it. In two instances the results fall just below 8·5, viz., 8·41 and 8·46. The former result is equivalent to the addition of one per cent. of water to milk of minimum standard

(*c*) In the single instance in which the three churns examined had been filled with the mixed milk of one herd, the results are in fairly close agreement. The milk in this instance was morning milk with an interval of 13½ hours since the previous milking.

1st Churn	3·88 per cent. fat	9·07 per cent. non fatty solids
2nd ,, ...	3·69 ,, ,,	9·23 ,, ,,
3rd ,, ...	3·81 ,, ,,	9·19 ,, ,,

(*d*) One sample was of *stale* morning milk. The milk was put in the churn at 7 a.m., and two gallons of afternoon milk were added at 5 p.m. The milk was sampled the following morning. The results are:—

Fat	3·23 per cent.
Non-fatty solids...	9·09 ,,

Instructions as to Sampling Milk for the Purposes of Milk Records.

As a result of the foregoing investigation, the following instructions have been drawn up for the guidance of farmers when taking samples with a view to ascertain the percentage of butter-fat in the milk of their cows. Particulars of the arrangements which have been made with Agricultural Colleges for the examination of such samples, and an explanation of the value of records of the milk yields of cows, are given in a revised edition of Leaflet 146, which is now available.

Samples of milk should be taken in all cases immediately after milking. It is of the utmost importance that the milk which is about to be sampled should be thoroughly mixed, and should not be allowed to stand after mixing before the quantity for the sample is taken.

The mixing may be carried out by agitation with a plunger. The plunger should consist of a circular metal plate, 6 to 7 inches in diameter, perforated with a number of half-inch holes, and attached to a handle sufficiently long to reach the bottom of the milk to be mixed. In mixing the milk the plunger should be pushed to the bottom of the vessel and brought to the top of the milk as rapidly as possible not less than ten times. The position of the plunger should also be moved from place to place to ensure that the whole of the milk at the bottom of the vessel is thoroughly roused and mixed with the upper layers.

If more convenient the milk in a particular vessel may be mixed before sampling by pouring the entire contents of the vessel into an empty vessel and back again three times.

A. *Testing the milk of one cow.*—All the milk, including the "strippings," drawn from the cow at a milking should be brought together in one vessel and thoroughly mixed. A portion of the milk should then be at once removed with a jug or a dipper and transferred to a clean dry bottle capable of holding at least a quarter of a pint. The bottle should be immediately corked and sealed.

If it is desired to take the sample in duplicate, the whole of the milk required to fill the two bottles should be taken from the mixed milk at one filling of the jug or dipper.

B. *Testing the milk of a herd*:—

(*a*) *Where the total quantity of milk from the herd can be placed in one churn, or vessel, or mixing tank.*

All the milk should be placed in one churn or receptacle, and mixed thoroughly, as described above. A sample should then be taken as under A.

(*b*) *Where the total quantity of milk from the herd fills more than one churn, and there is no single vessel available in which it may be mixed.*

The milk should be distributed as equally as possible among a number of churns or similar vessels. This may be conveniently carried out by pouring the milk as received from the milking of the herd into as many churns as may be required. The churns should not be filled, but the *same quantity* should be placed in each. If there remains a quantity of milk less than sufficient to fill a churn to the same content as the others, this quantity should be divided as equally as possible among the churns already used. When this has been done the contents of each churn should be thoroughly mixed, and one gallon taken from each. These portions should be placed in another churn or vessel, thoroughly mixed, and a sample taken as under A.

The bottle in which the milk is sent should be full, and a label should be affixed to it, bearing the name of the sender, full postal address, and the date on which the sample was taken.

Coccidiosis of Fowls.

The cause of Coccidiosis is the presence in the digestive tract of organisms of the class Sporozoa, called Coccidia. Coccidia are widely distributed in nature and are the cause of diseases in many animals and birds. The particular interest to poultry keepers is that while the common fowl is susceptible to this disease it is far more resistant to it than the turkey; where the two classes of birds are kept together, the fowl appears to infect the turkey and may be the starting-point of a serious plague sometimes called "Blackhead" of turkeys; coccidiosis of poultry is known under this title.

The steps to be taken to eradicate the disease from a poultry yard should be on the following lines:—

(1) It is known that coccidia live for twelve months, possibly much longer, after being evacuated by an infected bird. It is, therefore, practically impossible to disinfect a poultry run, and a change to fresh ground is necessary. If, however, the infected stock is moved to fresh ground, that ground will rapidly become infected. The old stock should, therefore, be left where it is, any birds which show symptoms of the disease being promptly killed. Only newly hatched chicks should be placed on the new ground, and all brooders, coops, feeding and watering utensils should be thoroughly disinfected before use. There must be no communication with the old infected yard.

(2) If hens are used for hatching there is a danger tbat they may infect the chicks, but if hens are preferred, then broody hens must be purchased from a clean stock.

Some of the infected hens may deposit coccidia on the shell of the egg, and if the disease has attacked their oviducts, coccidia may be found inside the egg. In either case the young chick may become infected, and suffer from the disease known as "White Diarrhœa of Chicks." All eggs, therefore, before being set should be dipped into a solution of 90 per cent. of alcohol, 10 per cent. of water.

If these suggestions cannot be carried out, or if fresh ground cannot be provided, the best procedure is: (1) to kill all birds exhibiting the first symptoms of the disease; (2) to take off about three inches of the top soil of the most

frequented parts of the runs and disinfect or burn it; (3) to disinfect thoroughly all houses, roosts, laying-houses, food and water utensils; (4) to use only healthy hens for sitting; and (5) to place eggs in a solution of 90 per cent. alcohol before setting them.

Silver Leaf Disease.

The twelfth report of the Woburn Experimental Fruit Farm contains an account of an interesting series of researches on the Silver Leaf Disease of fruit trees. The credit of identifying this disease with the fungus known as *Stereum purpureum*, belongs to Professor Percival of Reading, who in 1902 published an account of the life history of the pest. The difficulty of the investigation lay in the fact that the characteristic fruit of the fungus only appears after the death of the host. During the life of the tree, it is believed that the fungus permeates the living tissues in the form of minute threads, secreting poisonous materials which give rise to the characteristic symptoms of the disease, and eventual death of the tree. The work carried out at Woburn under the direction of Mr. Pickering during the last four years, confirms the conclusions reached by Professor Percival and, at the same time, contributes fresh material to our knowledge of the pest.

The fungus appears on a dead tree in the form of flat round discs of a purple, pink, or white colour, and it is the spores produced by these bodies which infect any healthy trees on which they gain a footing. There is reason to believe that the infection can only take place through wounds of the bark, and that while the affected tree is alive, it has no infective influence on its neighbours. It was found at Woburn that the only effectual means of inducing the disease in a healthy tree was to insert a small piece of the fungus in a cut made in the bark. The operation is followed in a week or two by a gradual silvering of the leaves. Hitherto it was believed that the disease invariably proved fatal. The experiments at Woburn, however, show that, on an average, one third of the trees attacked eventually

occurrence have been recorded on laurels, laburnums, apples, pears and currants. The plum is the most susceptible, the Victoria variety being the most liable to attack.

An extensive series of experiments on preventive measures has, unfortunately, not led to any definite result. Treatment with sulphate of iron, which is sometimes recommended, failed to check the disease. The only effectual method of combating the disease is the vigorous destruction of diseased trees before they reach the infective stage, that is, before death of the wood occurs. The mere uprooting of the tree is affirmed to be insufficient; it should be burnt as soon as possible. In the case of trees which are only slightly attacked, the removal of the affected branches may possibly arrest the disease, but the experiments at Woburn give no evidence that this treatment is likely to be successful.

SUMMARY OF AGRICULTURAL EXPERIMENTS.*

SOILS AND MANURING.

Value of Poultry Manure (*Cornwall C.C., Poultry Keeping for Profit, by W. Hawk*).—Poultry manure is generally considered to be particularly valuable, and analyses quoted in this report show it to be considerably richer than that of other live stock, especially in nitrogen and phosphates. In order to test the point in practice, experiments have been made by the Cornwall C.C. since 1904 with fowl manure in comparison with other nitrogenous manures. A series of quarter-acre plots were laid out on a second-rate pasture on a medium loam soil, and the manures were applied each year in the spring. One plot received 4 cwt. of superphosphate and 4 cwt. of poultry manure, and the others the same quantity of superphosphate, with respectively nitrate of soda, sulphate of ammonia, dried blood, fish guano, and Peruvian guano, the quantity of each applied containing the same amount of nitrogen as 1 cwt. of nitrate of soda. Taking the average of the six years the weight of hay produced on the unmanured plot was 9 cwt. per acre, with superphosphate alone 15½ cwt. per acre, and with superphosphate and each of the other manures, including poultry manure, about 30 cwt. per acre. The average cost of the nitrogenous manures was about 10*s*. per acre, and the increase produced by them 15 cwt. per acre. The increase due to poultry manure was 14½ cwt., so that 4 cwt. of poultry manure is estimated to be of almost as much

* A summary of all reports on agricultural experiments and investigations recently received will be given each month. The Board are anxious to obtain for inclusion copies of reports on inquiries, whether carried out by agricultural

value as *10s.* worth of the other five manures. Experiments on different crops and soils are necessary before an authoritative statement can be made as to the value of the manure, but this work has been carried far enough to show that poultry-keepers should take every precaution to guard against waste. Compared with the purchased nitrogenous fertilisers employed, poultry manure appeared to be worth rather over £2 5*s.* per ton.

Analyses of Manures and Soils (*Jour. Roy. Agric. Soc., Vol.* 70, 1910; *Trans. Highland and Agric. Soc., Fifth Series, Vol.* 22, 1910; *Jour. South-Eastern Agric. College, Wye, No.* 18, 1909; *Harper Adams Agric. Coll., Rept.,* 1909; *Aberdeen and North of Scotland Coll. of Agric. Calendar,* 1910–11).—The publications contain analyses of samples submitted to the consulting chemists with their observations.

In the *Journal of the Royal Agricultural Society* an analysis is given of road scrapings, and it is stated that the scrapings might be advantageously used for improving the mechanical condition and texture of land, but so far as manurial value is concerned the material was no better than ordinary soil.

Three analyses are given of soils on which crops would not thrive, and in which the proportion of magnesia was in excess of the lime. Experiments on this point are being conducted at the Woburn Experiment Station.

The *Journal of the South-Eastern Agricultural College* contains two analyses of poultry manure. One of these contained 0·78 per cent. nitrogen and 0·43 per cent. phosphoric acid, and the other 1·18 per cent. nitrogen and 0·03 per cent. phosphoric acid. It is stated that the composition varies considerably, and such manure should only be bought in bulk after an analysis has been made of an average sample.

FIELD CROPS.

Influence of Low Temperature on Plants (*Centralblatt für Bakteriologie, &c. Band* 28, *No.* 25, *December* 17*th,* 1910).—The phenomena connected with the temporary cessation of the activities of a plant on being subjected to low temperatures have been investigated by Professor A. Richter, of St. Petersburg, and the results of experiments are given in this publication. The fungus *Aspergillus niger* was chosen as the subject for experiment on account of its susceptibility to the influence of frost. The method followed was to place the plant in a flask and to subject it to degrees of frost varying between −1° C. and −13° C. (30° F. and 9° F.) in the open air for twenty-four hours. After aeration of the flask the activity of the organism was determined by estimation of the amount of carbonic acid gas (CO_2) produced. It was found that when the mycelium after thawing was placed at a temperature of 18° or 19° C. (64° F. to 66° F.) no life was visible, the production of CO_2 entirely ceasing. If, however, after thawing, the plant was placed at its optimum temperature of 30° to 34° C. (86° F. to 93° F.) it quickly began to grow, forming spores, and the energy of the production of CO_2 was increased. This latter phenomenon is noticeable even after subjection to very low temperatures. Moreover, after this treatment the plant became more inured to further low temperatures. The part played by this high temperature in [illegible]

in the case of seeds. The "death" of the plant is not a question of the destruction of all but a few cells, but of a general weakening of the plant, resulting in a complete cessation of its activity after thawing, and the "latent" life can only appear in the presence of favourable temperatures.

Effect of Formalin on the Vitality of Seed Grain (*Utah Agricultural Experiment Station, Bull. No.* 108).—An inquiry has been carried out by the Utah Agricultural Experiment Station as to the effect of formalin on the vitality of the seeds of wheat, oats, and barley. Five strengths of formalin solution were used, viz., one pound of formalin (*i.e.*, a 40 per cent. solution of formaldehyde in water) to 60, 50, 40, 30, and 2 gallons of water respectively. Several varieties of each of the cereals were tested, two hundred carefully cleaned, hand-picked seeds of each variety being treated in the varying solutions for ten minutes. Immediately after treatment the seeds were planted in pots. A similar number of untreated seeds was planted in each case in order to compare the percentage of seed germinating.

The following results were obtained:—

PERCENTAGE OF SEED GERMINATING.

Strength of Solution.	Wheat.	Oats.	Barley.
	per cent.	per cent.	per cent.
Untreated	97	90	88
1 lb. formalin to 60 gallons water ...	89	86	87
" " " 50 " " ...	91	91	90
" " " 40 " " ...	58	88	80
" " " 30 " " ...	46	71	59
" " " 2 " " ...	0	42	1

It would seem from this that a solution at the rate of 1 lb. of formalin to 50 gallons of water may be used with safety, though even at this strength it has an appreciable effect on the vitality of the seed.

Trials were also made of the effect of the length of time of treatment with a solution of this strength on the vitality of the grain. Treatment of the seed of wheat for 60 minutes was not found to be appreciably more injurious than treatment for 10 minutes. Where the seed was left in the solution for two hours, however, an appreciable decrease in germinating power resulted. Similar results were obtained in the case of oats and barley, though the barley seeds seemed to be slightly more susceptible to injury.

The seed was also kept for various periods before planting. It was shown that, except in the case of oats, six weeks may be allowed to elapse between treatment and planting. In this case, the seed should be thoroughly dried to prevent partial germination.

WEEDS, AND INSECT AND FUNGUS PESTS.

Destruction of Charlock (*Praktische Blätter für Pflanzenbau und Pflanzenschutz, Jan.–Feb.*, 1911).—This publication contains an account by Dr. Hiltner of experiments undertaken by the Agricultural and ... methods

per cent. solution, at the rate of 53 gallons per acre; nitrate of lime at the rate of 80 lb., 135 lb., and 180 lb. per acre; and three patent materials, the quantity used of each being 180 lb. per acre.

Plots of 120 sq. yards in size were chosen in a field under oats, strongly overgrown with charlock. They were treated on June 3rd in warm, calm weather, care being taken in the case of sulphate of iron and nitrate of lime that the plants were completely dry. Sand was mixed with the three other materials before treatment. Two days after spraying the drastic effects of sulphate of iron were visible, the weeds being destroyed except in places where an insufficient treatment had been given. The number of weeds on each plot was ascertained on June 21st, and the number and weight of the weeds and oats at harvest was also found. The results clearly showed that, among the remedies tried, spraying with a solution of sulphate of iron was the best method of eradicating charlock. On the plot on which this was used the yield of oats was three times as large as on any of the other treated plots, and six times as large as on the untreated plot. Treatment with the patent materials and with nitrate of lime was not nearly so efficacious.

In addition, sulphate of iron is stated to have been the cheapest material used. The cost of 53 gallons per acre is reckoned at 3*s.* 3*d.*, and other expenses connected with its application at 1*s.* 9*d.* per acre, or a total of 5*s.* per acre. Compared with this the cost of 80 lb. nitrate of lime works out at a total of 6*s.* 8*d.* per acre. Had there been a lack of nitrogen in the soil comparatively better results might have been obtained from nitrate of lime, owing to its value as a manure for the growing crop.

Wart Disease in Potatoes (*Memorandum on Wart Disease in Potatoes (No. 2) issued by the Board of Agriculture and Fisheries*).—Memorandum No. 1 on the experiments which were conducted on behalf of the Board of Agriculture and Fisheries in 1909 appeared in the *Journal* for December, 1909, p. 762. These experiments have been continued and amplified in 1910. The results bear out, with certain modifications, the conclusions that were arrived at from the first set of experiments, which much additional information has been obtained.

Experiments with remedial agents, such as Flowers of Sulphur, Black Sulphur, Copper Sulphate, Iron Sulphate, Liver of Sulphur, Paraffin, and three proprietary articles gave negative results. Many of the plants grew practically nothing but warts, and the attack seemed uniformly virulent on all the plots. An experiment was also made to test the value of "greening."* It was found that sprouted tubers of susceptible varieties when planted in soils infected with Wart Disease were more liable to produce a smaller crop of tubers and a much more prolific growth of warts than unsprouted tubers. It seems clear, therefore, that on badly infected soil these measures cannot be relied upon to protect the crop from disease.

Experiments were made with varieties with more satisfactory results. These experiments were of two kinds.

1. *Cottage Garden Experiments.*—In order to see whether the potatoes which were found to be disease-resistant when planted on certain [...] Lancashire, Cheshire, and Shropshire in 1909, would remain

* See *Journal*, April, 1910, p. 46.

immune when planted in cottage gardens or allotments in other districts, a supply of the "seed" potatoes of the three varieties, Conquest, Golden Wonder, and Langworthy, saved from the experiments conducted in 1909, was distributed to rather more than fifty centres in Cumberland, Lancashire, Cheshire, Staffordshire, Shropshire, Worcestershire, Warwickshire, Derbyshire, and Nottinghamshire. These potatoes were planted in badly infected soil, and with scarcely any exception proved to be disease-resistant. There is some reason to think that a few of these exceptions may have been due to "self-set" potatoes of some other variety that had been overlooked, since in only one centre were all three varieties attacked, and in every district in which one variety was attacked, the same variety grown on a neighbouring plot was immune.

2. *The College Field Experiments.*—Experiments were also made at two centres in Lancashire, one in Cheshire, and one in Shropshire with a number of different varieties of potatoes. The following were found to be entirely disease-resistant in three out of four centres:—Aberlady Early,* Sutton's Supreme,** Sutton's Abundance,* Dobbie's Favourite,* Conquest,** Davie's Laird,* White City,* The Crofter,* The Provost,* Langworthy,* Golden Wonder, Snowdrop,* Southern Queen,* What's Wanted,* Sutton's Discovery. These potatoes gave good crops in nearly every case. At the fourth centre those marked with a star were very slightly diseased, while those marked with two stars were rather more diseased. Some other varieties were also free, but gave a poor yield of small-sized tubers.

The following varieties were badly attacked:—Dickson's New Century, Sharpe's Victor (yellow), Sharpe's Victor (white), Gladiator, Myatt's Ashleaf, Rouge Royale, Midlothian Early, Puritan, Lady Llewellyn, Sutton's Centenary Britannia, Windsor Castle, Dickson's Eastern Planet, Snowdrift, Veitch's Syon House Prolific, The Prince, Tyne Kidney, Satisfaction, Reliance, The Scot, President Kruger, Sutton's Seedling, Goldfinder, Eclipse, Mayfield Blossom, Dalhousie, Factor, Scottish Triumph, Ladysmith, Edina, Harbinger, New Century, Sir John Llewellyn, Radium, Russet Green.

A few other varieties were only slightly attacked and might prove resistant on slightly infected soil.

In some cases badly attacked varieties gave nothing but a mass of warts.

The Board are informed that Champion and St. Malo Kidney have been successfully grown on infected soil, but these were not grown at any of the centres referred to above.

The following are the varieties which are recommended as having yielded, on the whole, good large crops free from Wart Disease:—

Early varieties.	Milecross Early, Aberlady Early.
Second Early.	Conquest, Sutton's Abundance.
Maincrop.	Davie's Laird, White City, The Crofter, The Provost, Langworthy, What's Wanted, Golden Wonder.

Residents in Cheshire, Shropshire, Staffordshire, and the neighbouring counties who experience any difficulty in procuring seed of immune varieties should communicate with the Principal, Agricultural

per cent. solution, at the rate of 53 gallons per acre; nitrate of lime at the rate of 80 lb., 135 lb., and 180 lb. per acre; and three patent materials, the quantity used of each being 180 lb. per acre.

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In addition, sulphate of iron is stated to have been the cheapest material used. The cost of 53 gallons per acre is reckoned at 3*s*. 3*d*., and other expenses connected with its application at 1*s*. 9*d*. per acre, or a total of 5*s*. per acre. Compared with this the cost of 80 lb. nitrate of lime works out at a total of 6*s*. 8*d*. per acre. Had there been a lack of nitrogen in the soil comparatively better results might have been obtained from nitrate of lime, owing to its value as a manure for the growing crop.

Wart Disease in Potatoes (*Memorandum on Wart Disease in Potatoes (No. 2) issued by the Board of Agriculture and Fisheries*).—Memorandum No. 1 on the experiments which were conducted on behalf of the Board of Agriculture and Fisheries in 1909 appeared in the *Journal* for December, 1909, p. 762. These experiments have been continued and amplified in 1910. The results bear out, with certain modifications, the conclusions that were arrived at from the first set of experiments, which much additional information has been obtained.

Experiments with remedial agents, such as Flowers of Sulphur, Black Sulphur, Copper Sulphate, Iron Sulphate, Liver of Sulphur, Paraffin, and three proprietary articles gave negative results. Many of the plants grew practically nothing but warts, and the attack seemed uniformly virulent on all the plots. An experiment was also made to test the value of "greening."* It was found that sprouted tubers of susceptible varieties when planted in soils infected with Wart Disease were more liable to produce a smaller crop of tubers and a much more prolific growth of warts than unsprouted tubers. It seems clear, therefore, that on badly infected soil these measures cannot be relied upon to protect the crop from disease.

Experiments were made with varieties with more satisfactory results. These experiments were of two kinds.

1. *Cottage Garden Experiments.*—In order to see whether the potatoes which were found to be disease-resistant when planted on certain farms in Lancashire, Cheshire, and Shropshire in 1909, would remain

* *Journal*, April, 1910, p. 46.

immune when planted in cottage gardens or allotments in other districts, a supply of the "seed" potatoes of the three varieties, Conquest, Golden Wonder, and Langworthy, saved from the experiments conducted in 1909, was distributed to rather more than fifty centres in Cumberland, Lancashire, Cheshire, Staffordshire, Shropshire, Worcestershire, Warwickshire, Derbyshire, and Nottinghamshire. These potatoes were planted in badly infected soil, and with scarcely any exception proved to be disease-resistant. There is some reason to think that a few of these exceptions may have been due to "self-set" potatoes of some other variety that had been overlooked, since in only one centre were all three varieties attacked, and in every district in which one variety was attacked, the same variety grown on a neighbouring plot was immune.

2. *The College Field Experiments.*—Experiments were also made at two centres in Lancashire, one in Cheshire, and one in Shropshire with a number of different varieties of potatoes. The following were found to be entirely disease-resistant in three out of four centres:—Aberlady Early,* Sutton's Supreme,** Sutton's Abundance,* Dobbie's Favourite,* Conquest,** Davie's Laird,* White City,* The Crofter,* The Provost,* Langworthy,* Golden Wonder, Snowdrop,* Southern Queen,* What's Wanted,* Sutton's Discovery. These potatoes gave good crops in nearly every case. At the fourth centre those marked with a star were very slightly diseased, while those marked with two stars were rather more diseased. Some other varieties were also free, but gave a poor yield of small-sized tubers.

The following varieties were badly attacked:—Dickson's New Century, Sharpe's Victor (yellow), Sharpe's Victor (white), Gladiator, Myatt's Ashleaf, Rouge Royale, Midlothian Early, Puritan, Lady Llewellyn, Sutton's Centenary Britannia, Windsor Castle, Dickson's Eastern Planet, Snowdrift, Veitch's Syon House Prolific, The Prince, Tyne Kidney, Satisfaction, Reliance, The Scot, President Kruger, Sutton's Seedling, Goldfinder, Eclipse, Mayfield Blossom, Dalhousie, Factor, Scottish Triumph, Ladysmith, Edina, Harbinger, New Century, Sir John Llewellyn, Radium, Russet Green.

A few other varieties were only slightly attacked and might prove resistant on slightly infected soil.

In some cases badly attacked varieties gave nothing but a mass of warts.

The Board are informed that Champion and St. Malo Kidney have been successfully grown on infected soil, but these were not grown at any of the centres referred to above.

The following are the varieties which are recommended as having yielded, on the whole, good large crops free from Wart Disease:—

Early varieties.	Milecross Early, Aberlady Early.
Second Early.	Conquest, Sutton's Abundance.
Maincrop.	Davie's Laird, White City, The Crofter, The Provost, Langworthy, What's Wanted, Golden Wonder.

Residents in Cheshire, Shropshire, Staffordshire, and the neighbouring counties who experience any difficulty in procuring seed of immune varieties should communicate with the Principal, Agricultural

College, Holmes Chapel, Cheshire, or the Principal, Harper Adams Agricultural College, Newport, Salop.

Inquiries made by the Board from the persons who grew these varieties last year show that:—

> Conquest was considered suitable nearly everywhere. It was found to be a good cropper and of high quality, being described in many cases as superior to British Queen, a susceptible variety much grown in Cheshire. On the other hand, it is susceptible to ordinary Potato Disease (*Phytophthora infestans*), and does not keep well.
>
> Langworthy was considered suitable in all but a very few cases. It is described as a good cropper, though not so good as Up-to-Date, which is a susceptible variety, but much better as regards cooking quality. It is not liable to be attacked by ordinary Potato Disease, and keeps very well.
>
> Golden Wonder was considered the best of the three varieties in many districts. It is said to be a good cropper of good cooking quality and keeping power.

Wart Disease of Potatoes (*Year Book of Holmes Chapel Coll. of Agric.*, 1909).—Wart disease has been more prevalent in Cheshire than elsewhere, and a number of experiments were carried out in 1909 in the hope of finding a remedy, or a means of prevention. No method of treating the soil that would check the disease was found, but trials showed that some varieties of potatoes are very little susceptible or quite immune to it. Unfortunately these are not of great cropping value. A fuller report on the experiments appeared in the *Journal* for December, 1909, p. 762, and on the continuation of them in the *Journal* for October, 1910, p. 556.

Wart Disease of Potatoes (*Field Expts. in Staffs and Salop and at Harper Adams Coll., Rept.*, 1909).—Reports on the experiments carried out at this college in 1909 and 1910 to discover varieties of potatoes that are immune to Wart Disease and with various fungicides were given in the *Journal*, December, 1909, p. 762, and October, 1910, p. 556. The only dressing that checked the disease to any extent was copper sulphate. This was applied at two periods during the growing season. One plot received a dressing when the potatoes were planted, but it had no effect on the disease. Another plot was dressed early in July, and although a little disease was found on the margins of the plot—possibly where the dressing had not reached—the remainder of the plot (5 square rods) was quite free. In all probability the copper sulphate was put on at the time the zoospores were liberated from the resting spores and destroyed them. The only drawback to the use of copper sulphate is the reduction in the crop, which is considerable; the plot dressed with copper sulphate produced only 457 lb. of clean, saleable tubers, while the control plot produced 790 lb.

Experiments with American Gooseberry Mildew and Wart Disease of Potatoes (*Board of Agric., Rept. of Intelligence Division, Part II.*, 1909–10).—The effect on American Gooseberry Mildew of winter spraying with a form of Bordeaux mixture was tested in 1909. It had been reported to the Board that a solution, described as "sour Bordeaux," had proved successful against the disease in Denmark, and a badly

infected garden at Wisbech was accordingly sprayed in November and again in the following April. The disease, however, subsequently appeared.

A few experiments were tried to see if any good result could be obtained from the winter treatment of the soil. Bordeaux mixture (Woburn formula), kainit, and lime were applied, but did not appear to have any effect.

The experiments with regard to Wart Disease were directed (1) to testing the effect of certain dressings, such as sulphur, lime, lime and sulphur, soot, and soot and sulphur, and (2) to testing varieties for their resistance to the disease. The dressings proved to be a failure, none of the substances used producing any marked diminution of disease.

The variety experiments proved more successful, and it appeared that certain varieties, such as Conquest, Langworthy, What's Wanted, and Golden Wonder were almost if not entirely immune. (See Memorandum on Wart Disease (No. 1 and No. 2) referred to above.)

The Making and Application of Bordeaux Mixture, with Notes on Bordeaux Injury.—The Sclerotinia (Botrytis) Disease of the Gooseberry, or "Die-back" (*Jour. South-Eastern Agric. Coll., No.* 18, 1909).—The first of these two reports appeared in the *Journal* for January, 1910, p. 793, and May, 1910, p. 103, and the second appeared in the *Journal* for April, 1910, p. 1.

A New Disease of the Mangold (Sclerotinia) (*Jour. South-Eastern Agric Coll., No.* 18, 1909).—Specimens of mangolds from a clamp sent to the college were found to be attacked by a disease, the characteristic symptom of which was a dark brownish or blackish discoloration of parts of the inside of the root. This was an early stage of the disease. In a latter stage parts of the surface of the root softened and turned brownish, and then soon afterwards a rapid rot set in, and the whole root decayed. The disease was found by Professor Salmon to be due to a species of the fungus *Sclerotinia* or *Botrytis*. Some experiments were made to ascertain whether the fungus alone was responsible for the decay of the roots. Plugs were cut out of two lots of healthy mangolds and swedes; the cut surfaces of some were inoculated with the *conidia* of the fungus, and the plugs replaced, and in the rest the plugs were replaced without inoculation. After intervals of twenty-six and fourteen days respectively the roots were cut across, when the disease was found to have spread in the plug and in the parts of the roots round it. Powdery tufts of the *Botrytis* fructification of the fungus were abundant, and the mycelium had permeated the surrounding tissue. In the case of a mangold left for twenty-six days, the blackish discolouration extended for two and a half inches in all directions from the lower end of the plug. The roots from which plugs had been cut but no inoculation made were also cut across, but no discoloration was observable, showing that in the other cases it was due to the fungus and not to the injury made in cutting out the plug.

The fungus does not appear to have been recorded before as attacking mangolds, but species of *Botrytis* are very common on dead or dying vegetable substances, and could spread readily in the damp atmosphere of a clamp through any cracks or wounds in the surface

of the roots. Professor Salmon recommends that where serious loss has occurred the following precautions should be adopted:—

(1) Before making the clamp, clear up and burn all rubbish consisting of dead or decaying vegetable matter in the immediate neighbourhood.

(2) Ventilate the clamp as well as possible, and choose a spot where there is natural drainage.

(3) Cut or bruise the roots as little as possible, and reject carefully all roots that are not sound.

(4) Never use turnip, swede, or mangold tops, or potato haulm, on the roof of the clamp.

A clamp should not be made again on the same piece of ground on which infection occurred in a previous year, as *Sclerotinia* may be lurking in the soil.

Potato Spraying (*Jour. Roy. Agric. Soc., Vol.* 70, 1909).—Potatoes were sprayed with three different spraying mixtures, *viz.*, Bordeaux mixture, Woburn Paste, and Strawsonite, and on another plot, when disease began to appear, the "tops" of the potatoes were cut off altogether. Disease was very prevalent throughout the crop. The crops of ware potatoes were as follows:—Not sprayed, tops left on, 3 tons 5 cwt.; not sprayed, tops cut off, 5 tons 6 cwt.; Bordeaux mixture, 6 tons 7 cwt.; Woburn paste, 6 tons 1 cwt.; Strawsonite, 6 tons 11 cwt. All the methods of spraying thus increased the crop largely, and cutting off the tops when the leaves began to be affected with disease had the same effect. The increase was not, however, due to a smaller proportion of diseased potatoes on the treated plots, as the diseased part of the unsprayed crop was 5 cwt., while on the sprayed plots and where the tops were cut off it amounted to one ton and over. The results open up some interesting questions as to what are the changes that really take place under the influence of spraying, and a full report on the experiments will be made by Mr. Spencer Pickering, of the Woburn Experimental Fruit Farm.

Potato Spraying (*Univ. Coll. of N. Wales, Bangor, Agric. Dept., Bul.* 8, 1909).—The plan of these experiments was the same as in 1908, when they were designed not only to demonstrate the advantages of spraying, but to ascertain whether it paid to spray more than once, and, if not, whether the single spraying should be early or late. They were carried out at seven centres with a solution of 24 lb. sulphate of copper and 30 lb. pure washing soda in 120 gallons of water. The early sprayings were all done between July 6th and 14th, and the late sprayings between July 20th and August 6th. The results again show the importance of spraying, considerable increases having been obtained at all the centres, the best in most cases being where the crop was sprayed twice. Of the single sprayings the later one seems to have been the more effectual, whereas in 1908, although those sprayed twice were the best, the earlier single spraying did better than the later one. This difference is probably due to the fact that whereas the season of 1908 was a comparatively early one, the season of 1909 was a late one. The average crops obtained in 1909 were:—Unsprayed, 11 tons 3 cwt.; sprayed once, early, 11 tons 17 cwt.; sprayed once, late, 13 tons 8 cwt.; sprayed twice, 13 tons 12 cwt. Prof. Winter observes that "It is evident from this, that whether the

potatoes were sprayed once, early or late, or whether they were sprayed twice, the operation has paid for itself well. So far it seems certain that it is more profitable to spray twice, and there is no doubt it is advisable to do so wherever possible."

Potato Spraying (*Somerset C.C. Agric. Instruc. Com., Rept. for Period Ending March 31st,* 1910).—Spraying was carried out on four farms with Strawsonite. In each case there were three plots, an unsprayed one of two perches, and two of four perches, one of which was sprayed once and the other twice. The first spraying was carried out between July 5th and 12th, and the second spraying between August 3rd and 6th. Taking the average of the crops at the four centres, the weights of marketable potatoes were:—Unsprayed, 8 tons 13 cwt.; sprayed once, 10 tons 18 cwt.; sprayed twice, 10 tons 13 cwt. The effect of spraying was to increase the vigour of the tops and prolong the period of growth so that a larger crop was obtained, but it did not appear to be effective in checking disease. On the average the percentage of diseased potatoes was larger where spraying was carried out.

Potato Spraying (*Roy. Agric. Coll., Cirencester, Agric. Students' Gazette,* December, 1910).—One trial of spraying with Bordeaux mixture was carried out in 1910. Four plots were treated as follows:—Plot 1, unsprayed; plot 2, sprayed once, on June 30th; plot 3, sprayed once, on July 21st; plot 4, sprayed twice, on June 30th and July 21st. Heavy rain followed the June spraying, and a certain amount of the deposit was washed off. Disease was very prevalent, and the haulm on plot 1, and to a less degree plot 2, became diseased and dead, while that on plots 3 and 4 was still green. The crops of ware were at the following rates:—Unsprayed, 6 tons; sprayed on June 30th, 7 tons 4 cwt.; sprayed on July 21st, 12 tons 2 cwt.; sprayed twice, 10 tons 11 cwt. The quantity of diseased tubers was considerably decreased by the spraying in this trial. It is noted that the fine weather in September and October was favourable to the spraying, while in a wetter summer the prolonged growth of the haulm might have been detrimental by preventing ripening. The cost of the spraying is calculated to be about 12*s.* per acre with a knapsack sprayer, or 9*s.* per acre if a horse machine were used.

Finger-and-Toe Disease (*Worcestershire Educ. Com., 14th Rept. on County Exptl. Garden, Droitwich,* 1909).—These experiments were begun in 1903, with the object of destroying the disease in a plot in which it had become strongly established. Annual dressings of gas lime until 1907, and of Apterite and Vaporite in 1908 and 1909, have been ineffective, the whole of the plants being badly affected. Caustic lime has been more successful; 74 per cent. of the plants were free from disease on the plot where the lime was left on the surface, and 71 per cent. where it was dug in. The remaining plants were only slightly affected. The average of clean plants for the three years has been about 72 per cent. where the lime was left on the surface and 63 per cent. where it was dug in.

Finger-and-Toe Disease (*Northumberland Agric. Expt. Stat., Cockle Park, Bul.* 14).—A report on the experiment was summarised in the *Journal* for January, 1910, p. 856, and the results obtained in 1909 are similar. The effect of the dressings in checking the disease has in

most cases been satisfactory, and the proportion of badly diseased roots was quite small, except on the undressed plot, and where gas lime was used. Good results were obtained from the two plots receiving dressings of 2 tons ground lime and 3 tons of ground limestone respectively, applied in 1907. These dressings gave practically no result in the year of application, but were effective in 1908, and still more so in 1909, in which year about 22 and 26 tons of swedes per acre respectively were grown on the plots of what was considered incorrigible finger-and-toe land. The soil of this field is a poor clay loam on a poor Boulder Clay subsoil, a type of soil on which swedes suffer severely in Northumberland.

On another field, with a light sandy soil, smaller dressings of from one to five tons of lime have been given each year since 1897 with success. The disease has not done nearly so much harm on this soil as on the poor clay.

Insect Pests (*Jour. South-Eastern Agric. Coll., Wye, No.* 18, 1909).—The Report on Economic Zoology by Mr. F. V. Theobald contains an illustrated description of a large number of insects as to which advice was sought from the College in 1908–9, with notes on the preventive and remedial measures necessary.

In the case of Apple Sawfly (Hoplocampa testudinea, Klug.), *further* trials of spraying with arsenate of lead were made, but without result. Various sweet and poisonous baits were also tried without success. The only way of keeping down the pest that has been found of any use is to have all attacked fruit collected and *burnt* during the thinning of the fruit. To throw the small, thinned-out fruitlets on the ground, as is frequently done, is useless.

The good results of a lime and salt wash (1½ cwt. fresh lime, 30 lb. salt, to 100 gallons of water) against Apple Sucker (*Psylla mali*, Schmid) have been confirmed. The lime and salt treatment, together with a single spraying of nicotine wash as soon as the blossom has fallen, will completely check this insect. Some growers reported that, at the amount recommended, the salt had scorched the buds, and accordingly further experiments were made in February with various quantities of salt up to 40 lb. per 100 gallons on several varieties of apples, and no harm whatever resulted.

Experiments have been carried out with different kinds of grease for grease-banding fruit trees. A report on these appeared in the *Journal* for October, 1910, p. 542. A large number of greases and different methods of using them were compared, and the insects caught were examined.

The Use of Nicotine Wash (*Jour. South-Eastern Agric. Coll., Wye, No.* 18, 1909, *p.* 134).—Nicotine wash was tried on a number of insects at different stages of growth. Solutions have been used containing 1½ oz., 1 oz., and ½ oz., of 98 per cent. nicotine in 10 gallons of water, and similar solutions with ½ lb. of soft soap in addition. In all cases the effect of the nicotine was greatly increased by soft soap. Nicotine and soap each killed certain of the insects, but the mixture was much more fatal than either alone. It was most effective when used against Apple Sucker (*Psylla mali*), Thrips, Cuckoo Spit, young caterpillars, and some aphides—the Plum Aphis and the Currant Aphis. The result was doubtful in the case of mature caterpillars, and against the Turnip Flea and Cabbage Flea and the Celery Fly nicotine was quite useless.

Black Currant Mite (*Shepton Mallet Grammar School, Rept.*, 1909).—Infested black currant bushes were sprayed in winter with V_1 fluid, and every diseased bud and twig was cut off. In spring, before fruiting, they were twice sprayed with V_2, and again after the fruit had been gathered. After this treatment it was found in December that the number of abnormally swollen buds was only 10 per cent. of the usual number.

HORTICULTURE, CIDER, AND HOPS.

Pruning of Apple Trees (*Field Experiments in Staffs and Salop and at Harper Adams Agric. Coll., Joint Report*, 1909).—An experiment to determine the effect of root and branch pruning was begun in 1902 with 24 trees, 8 each of three varieties. In 1909, as in previous years, the trees that were unpruned formed more fruit buds than the pruned trees, especially in the case of Cox's Orange Pippin. The average increase in diameter of the stem of the unpruned trees is less than that of those pruned regularly, the weakest growing variety (Cox's Orange Pippin) showing the greatest difference. The average diameter in inches at 4½ ft. above the ground was as follows in 1909:—

	Unpruned Trees.	Pruned Trees.
Cox's Orange Pippin	2·25	2·81
Bismarck	2·39	2·96
Bramley's Seedling...	2·76	3·32

Effect of Grass on the Growth of Apple Trees (*Field Expts. in Staffs and Salop and at Harper Adams Agric. Coll., Joint Report*, 1909).—Apple trees planted in grass and on cultivated land have been measured since 1905, and the difference in favour of cultivated ground has been very marked. In 1907 a modification was made, when a square of turf measuring 4 sq. yards was removed from round each alternate tree on grass. They have grown vigorously since, and there is now a noticeable difference between the two sets. The growth of the trees, measured by the diameter in inches at 4½ feet from the ground, has been as follows:—

	On Grass. 1905.	On Grass. 1909.	On Cultivated Ground. 1905.	On Cultivated Ground. 1909.	Turf removed in 1907. 1909.
Cox's Orange Pippin	0·82	1·19	1·11	2·53	2·00
Bramley's Seedling	0·78	1·82	1·20	2·86	2·12
Bismarck...	1·03	1·70	1·31	2·61	2·03

The Blossoming of Apple Trees (*Twelfth Report of the Woburn Experimental Fruit Farm*, 1910).—This Report contains a summary of observations extending over five years regarding the time of blossoming of apple trees. The most noteworthy fact which emerges is that the first appearance of blossoms is more dependent on the calendar than on the weather. With the exception of one year the date of the first appearance of blossoms varied only from April 27th to 30th. A slight tendency was observed for trees on the paradise stock to blossom

With regard to the time of ripening, it was found that there is not necessarily any connection between early blossoming and early fruiting, though, on the average, early blossom is correlated with early fruiting.

The general results are briefly summarised in the report as follows:—Apples which are early in ripening, blossom, on the average, two or three days earlier than late varieties; but this is only a general rule to which there are many exceptions. The character of the fruit (dessert or cooking) has no effect on the relative date of blossoming. The actual date on which blossoming commences has no definite effect on the period over which the coming into blossom of a number of different varieties will extend; this seems to be determined solely by the weather conditions prevailing at the time. Some varieties habitually blossom earlier or later than others, but in the majority of cases such early or late habits are so little marked that, on the average, they exercise only about one-third as much influence in determining the order of blossoming as do the weather conditions at the time, so that it is futile to attempt to draw up any precise list of the order of blossoming of a large number of varieties. On the average the same variety will occupy a place in such a list $2\frac{1}{2}$ days different in one season from what it occupies in another, whereas two different varieties selected at random will occupy in the same year positions differing by $3\frac{1}{3}$ days. Varieties of apples of foreign origin showed no peculiarities in the date of their blossoming.

Experiments with Hops (*Jour. South-Eastern Agric. Coll., Wye, No.* 18, 1909).—The investigation on the influence of the male hop on the growing-out of hops was continued in 1909. Professor Salmon states that an examination of samples of the crop in the College hop garden for the past four seasons shows strikingly the effect of fertilisation in increasing the crop. The average length of the hop has gradually increased from 0·85 in. in 1906 to 1·19 in. in 1909, without any other reason than fertilisation, which is shown by the increase in the number of seeds per hop. Further, the quality of the hops has improved from the market standpoint, as shown by the prices obtained. In 1906 the hops were not grown-out, because of the non-production of sufficient seed, while in 1909 they were well grown-out.

It is pointed out that it is not possible in the case of the Golding varieties of hops at present grown in this country to produce a crop of seedless hops that are grown-out sufficiently to obtain a good price, while on the other hand certain varieties grown in Bavaria produce large seedless hops. The explanation is that the number of bracts and bracteoles (or petals, as they are called collectively) is greater in these German varieties than in the English Golding varieties. The greater the number of petals per hop—a character dependent apparently not only on the particular variety of hop grown, but also on conditions of soil, cultivation, and season—the less need there is of the presence of seed in order to obtain the growing-out of the hop. It is so seldom the case, however, with English hops that the number of petals per hop is sufficient to allow the grower to grow seedless hops that the supply of male hops in a garden must be looked upon as a point of primary importance.

Experiments are being made to ascertain whether seedless hops of a

varieties of Bavarian hops. The work of forming new varieties by means of crossing has also been continued, and a good stock of seedling hops of different parentage is now available for trial by growers.

LIVE STOCK AND POULTRY.

Experiments in Baby Beef Production in the United States (*Michigan Agric. Coll. Expt. Stn., Bull.* 261).—Experiments extending over three years have been carried out at this station to test the results obtained from rearing calves from birth until about eighteen months old, when they were sold for beef. Two methods were compared, the calves being suckled by their dams in one case, and in the other weaned at birth and reared by hand.

A herd of twenty average cows of the Shorthorn type were purchased for the purpose. They were in calf to Shorthorn bulls, so that the first lot of calves may be considered as Shorthorns. In the following year they were sired by a pure-bred Hereford bull, and in the third year by a pure-bred Aberdeen Angus. The twenty cows were divided into two lots. The calves of Lot I. were allowed to run with their dams for three or four days, after which they were allowed to suckle twice daily. As soon as they could be induced to eat they were given grain, roots and hay, and were weaned at eight or nine months, when the cows were practically dry. The cows were pastured during the summer, but the calves were kept in the yards, as no pasture was available for them.

The calves of Lot II. were reared on whole milk from the pail for four or five weeks, and then on skim milk with grain and hay. At eight months the skim milk was discontinued, and the feeding of both lots was then identical, except that the quantities were varied in individual instances.

In the first year the average weight of the calves which were suckled by their dams was, at 18 months, 937 lb., while the weight of the calves of Lot II., which were fed from the pail, was 918 lb.

In the second year, the average weights were respectively 1,016 lb. and 982 lb., and in the third year 1,032 lb. and 999 lb.

The result of the experiment over the three years appears to show that there is no great difference between the two methods as regards the quality of the beef produced. The skim milk fed lots are stated to have been of quite as good quality as the suckled lots, and the average weight over the three years was 966 lb., as compared with the 995 lb. of the suckled calves.

The lots were sold at the same time and fetched the same price per cwt. The calves raised on skim milk cost substantially less than the others, in addition to which allowance must be made for the fact that the cows suckling their calves gave no other return during the season.

Laying Test with Different Breeds of Poultry (*Univ. Coll. of Wales, Aberyswyth, Agric. Dept., Bull.* 1).—In this trial the merits as layers of Buff Orpingtons, Plymouth Rocks, and Partridge Wyandottes were compared. The birds were all hatched in the spring of 1908, and in

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mouth Rock pen started laying late in December, and then only produced five eggs in that month, but the other two pens started at the beginning of the month. The records were kept until March 18th, and the number of eggs laid by each pen in each month and during the whole period are shown in the following table:—

	Dec.	Jan.	Feb.	March 1st to 18th.	Total.
Plymouth Rock	5	46	110	76	237
Buff Orpington	86	123	127	85	421
Partridge Wyandotte ...	105	172	138	93	508

The average weight of the eggs of each breed was:—Plymouth Rock, 2·18 oz.; Buff Orpington, 1·91 oz.; Partridge Wyandotte, 1·87 oz.

The pen of Partridge Wyandottes contained only nine birds, while the other two pens contained ten each. Taking this into consideration, it will be seen that in this trial the Partridge Wyandottes were the most satisfactory as winter layers.

DAIRYING.

Influence of Watery Food on the Production of Milk (*Die Landw. Versuchs-Stationen. Band lxxiv., Heft. iii.-v.*).—In continuation of the information given in the *Journal* for February, 1911, p. 910, as to the effect on milk production of giving abnormal quantities of water to cows, the following account of an experiment carried out by Professors F. Fangl and A. Zaitschek, of the Budapest Animal Physiology Experiment Station, may be of interest.

The watery foods chosen were maize pulp, pumpkins, roots, potatoes, and lucerne. Ten cows were divided into three groups of four (two cows appearing in two groups). Each group served for testing different foods, viz., maize pulp and pumpkins in Group I., roots and potatoes in Group II., and lucerne in Group III. The length of time during which each cow was under experiment was divided into five periods, During the first period two of the cows in a group were given watery food, while the remaining two had dry food; this was followed by a period of transition, after which the cows that had been receiving watery food received dry food, and *vice versâ*. After another period of transition a return was made in period 5 to the food of period 1. A sufficient quantity of food was given in every case to bring about an increase in live-weight of the animals, so that a maximum milk production was ensured. The following were the quantities of foods given daily per 1,000 lb. live-weight:—Maize pulp, 89 lb.; pumpkins, 133 lb.; roots, 82 lb.; potatoes, 34 lb.; lucerne, 76 lb. Care was also taken that the cows were given a large amount of albuminoids, and that the amount of nourishment contained in the watery and dry foods was as nearly equal as possible. The average daily increase in live-weight was practically the same for the two foods.

The water-content of the foods was as follows:—Maize pulp, 93·89 per cent.; pumpkins, 92·09 per cent.; roots 85·36 to 87·72 per cent.; lucerne, 76·59 per cent.; potatoes, 74·48 per cent. No restrictions were made as to the amount of water allowed to each cow, and it was noticed that the cows fed on maize pulp and pumpkins drank very little water, while those fed on roots, potatoes, and lucerne

contained in the watery foods, the average consumption of water in periods when watery foods were given, was 30 per cent. greater than when dry foods were given.

It was found that this increased consumption of water had no effect on the milk yield, and the average composition of the milk produced from watery food did not differ from that produced from dry food. No support was obtained for the contention that watery foods give a poorer milk than dry foods. The increased consumption of water when watery foods were being used caused no change in the milk, and did not influence the yield. Variations were found to exist as regards individual foods; *e.g.*, maize pulp, roots, and lucerne increased the yield, potatoes decreased it somewhat, while pumpkins caused a large decrease. The article contains information as to former investigations into the same question.

INFORMATION AS TO THE LIGHT HORSE BREEDING SCHEME.

A copy of the Regulations made under the Light Horse Breeding Scheme with regard to the conditions of service of Premium Stallions, &c., was given in last month's *Journal*, pp. 1020–7. The regulations and conditions of award of Premiums to stallions are given below :—

Regulations and Conditions of Award of Premiums to Stallions.

(A) KING'S PREMIUMS.—1. The award of a King's Premium entitles the owner of the stallion to the following payments by the Board, namely :—

On the award being confirmed, fifty guineas.

After the expiry of one month from the close of the season of service for which the premium has been awarded—

For every mare served during such season (*a*) a fee of one and a half guineas if a certificate signed by the Corresponding Member of the District Committee concerned is forwarded to the Board stating that the stallion has regularly travelled the district for which he has been awarded a premium, or (*b*) a fee of one guinea if no such certificate is forwarded. Service fees will not, however, be paid in any one season for more than ninety mares served by the same stallion.

After the close of the foaling season in the following year, a further fee of twelve shillings and sixpence will become payable to the owner of a King's Premium Stallion for every foal dropped by the mares served during the season of service for which the premium has been awarded.

Forms will in due course be furnished to owners of stallions for the purpose of claiming the service and foal fees payable hereunder by the Board.

2. A stallion winning a King's Premium is to serve not less than fifty half-bred mares, if required, exclusive of any mare for the service of which a *free* nomination ticket has been issued to the owner of the mare, or of any brood mare which has been purchased and leased to

3. A King's Premium Stallion is to stand or travel as the Board may direct in the district for which he has been awarded a premium at a fee chargeable to the owner of the mare not exceeding two pounds for each mare served, exclusive of the groom's fee of two shillings and sixpence, except when the owner of the mare presents a *free* nomination ticket, and then no fee other than the groom's fee may be charged to the owner of the mare, the service fee of two pounds being in such case payable by the Board to the stallion owner at the close of the service season.

The average estimated payments *by the Board* in respect of a King's Premium Stallion are therefore :—

	£	s.	d.
Premium	52	10	0
Service fee of £1 1*s*. for 50 mares	52	10	0
"Travelling" fee of 10*s*. 6*d*. for 50 mares ...	26	5	0
Foal fee of 12s. 6d. for 30 foals	18	15	0
	£150	0	0
In addition—A service fee of £2 a mare is *chargeable to owners* of mares :—			
Service fee of £2 for 50 mares	100	0	0
Estimated average payments ...	£250	0	0

The maximum estimated payments *by the Board* in respect of a King's Premium Stallion are therefore :—

	£	s.	d.
Premium	52	10	0
Service fee of £1 1s. for 90 mares	94	10	0
"Travelling" fee of 10*s*. 6*d*. for 90 mares ...	47	5	0
Foal fee of 12*s*. 6*d*. for 50 foals	31	5	0
	£225	10	0
In addition—A service fee of £2 a mare is *chargeable to owners* of mares :—			
Service fee of £2 for 90 mares	180	0	0
Estimated maximum payments ...	£405	10	0

4. Until further notice, King's Premiums will be awarded to thoroughbred stallions at a spring show to be held annually in London. The number of Premiums to be awarded will be announced by the Board in connection with the arrangements for each show.

The Premiums will not be paid unless or until a stallion is registered under the Registration Scheme of the Board.* If a King's Premium Stallion is removed from that Register during the season of service, the owner will not be entitled to any payment by the Board for a service after the date of removal or for any foal from any such service.

5. Great Britain has been divided into 19 districts for the purposes of the award of King's Premiums. Particulars as to the number of

* *Journal*, March, 1911, p. 1020.

Premiums to be awarded in each of the various districts, and full information as to the regulations and conditions under which the show is to be held, can be obtained on application to the Board.

6. The following diseases will be held to disqualify a thoroughbred stallion competing for a King's Premium :—Roaring, whistling, ringbone, unsound feet, navicular disease, spavin (bone), cataract.

(B) BOARD'S PREMIUMS.—7. Until further notice applications for these Premiums are to be made direct to the Board, and no application will be entertained unless the stallion, for which it is made, is shown to be entered or accepted for entry in the stud book of his breed.

8. The award of a Board's Premium entitles the owner of the stallion to the following payments by the Board, namely :—

After the expiry of one month from the close of the season of service for which the Premium is available—

For every mare served during such season (*a*) a fee of one pound seven shillings if a certificate signed by the Corresponding Member of the District Committee is forwarded to the Board, stating that the stallion has regularly travelled the district for which he has been awarded a Premium, or (*b*) a fee of one guinea if no such certificate is forwarded. Service fees will not, however, be paid in any one season for more than ninety mares served by the same stallion.

After the close of the foaling season in the following year, a further fee of five shillings will become payable to the owner of the stallion for every foal dropped by the mares served during the season of service for which the Premium has been awarded.

Forms will in due course be furnished to owners of stallions for the purpose of claiming the service and foal fees payable hereunder by the Board.

9. Each Board's Premium Stallion is to serve not less than fifty mares, if required, exclusive of any mare for the service of which a *free* nomination ticket has been issued to the owner of the mare, or of any brood mare which has been purchased and leased to a farmer or other person by a County Committee.

10. A Board's Premium Stallion is to stand or travel as the Board may direct in the district for which he has been awarded a Premium, at a fee not exceeding one pound, chargeable to the owner of the mare for each mare served, exclusive of the groom's fee of two shillings and sixpence, except when the owner of the mare presents a *free* nomination ticket, and then no fee other than the groom's fee may be charged to the owner of the mare, the fee of one pound becoming in such case payable by the Board to the stallion owner at the close of the service season.

The average estimated payments *by the Board* in respect of a Board's Premium Stallion are therefore :—

	£	s.	d.
Service fee of £1 1s. for 50 mares	52	10	0
"Travelling" fee of 6s. for 50 mares	15	0	0
Foal fee of 5s. for 30 foals	7	10	0

In addition—A service fee of £1 a mare is *chargeable to owners* of mares :—			
Service fee of £1 for 50 mares	50	0	0
Estimated average payments ...	£125	0	0

The maximum estimated payments *by the Board* in respect of a Board's Premium Stallion are therefore :—

	£	s.	d.
Service fee of £1 1s. for 90 mares	94	10	0
"Travelling" fee of 6s. for 90 mares	27	0	0
Foal fee of 5s. for 50 foals	12	10	0
	£134	0	0
In addition—A service fee of £1 a mare is *chargeable to owners* of mares :—			
Service fee of £1 for 90 mares	90	0	0
Estimated maximum payments ...	£224	0	0

11. It is a condition precedent to the acceptance of a stallion for a Board's Premium that he shall have been registered under the Board's registration scheme. He shall also be submitted for examination by a veterinary surgeon appointed by the Board, if they so direct. If a Board's Premium Stallion is removed from the Register during the season of service, the owner will not be entitled to any payment by the Board for a service after the date of removal or for any foal from any such service.

12. Great Britain has been divided into 19 districts for the purposes of the award of Board's Premiums.

13. Not more than fifty Board's Premiums will be available for the year 1911. In awarding the Premiums at their disposal, the Board will have regard to the class of stallion most required in each district, and to the availability of suitable stallions in the different parts of such district.

GENERAL.—14. The service season is from April 1st to July 31st.

15. No Premium will be awarded in respect of any stallion which is under 4 or over 20 years of age.

16. No stallion is to be exhibited *for competition* during the season of service.

17. The Collection of the fees due from the owner of the mare is a matter to be arranged between him, the District Committee, and the owner of the stallion, in accordance with the Regulations and Conditions of Service of Premium Stallions (H[35]), copies of which can be obtained free of charge on application to the Board.

18. The requirement that a Premium Stallion is to serve mares at a limited fee applies only to mares in the district as regards which the Premium has been awarded.

19. Forms of application for Premiums and any further information on the subject can be obtained from the Secretary of the Board of Agriculture and Fisheries. Envelopes addressed to him need not be stamped. (H[29].)

With reference to the procedure detailed in the Memorandum H13* in connection with the award of free nominations, County Committees are requested to note the additional arrangements herein set out.

Further Memorandum as to the Duties and Procedure of County Committees.

1. The Board will notify to the Secretary of a County Committee the number of free nominations which the Committee are authorised by the Board to issue, and such notification will be made as soon as is possible after the allocation of Premium Stallions to a district has been made.

2. The period during which applications for free nominations can be made to a County Committee will be from April 1st to 30th, and subsequent to the latter date by special sanction of the County Committee.

3. It is very desirable that County Committees should arrange to meet on May 1st, or as soon after as is possible, to consider the applications received.

4. The Veterinary examination of the Mares for which applications are made is an essential preliminary to the grant of a free nomination. Where, however, the number of applications for free nominations largely exceeds the number of nominations at the disposal of the Committee, it is not intended that the mare of every applicant should be subjected to veterinary examination, and the number to be examined is not, without the special authority of the Board, to exceed half as many again as the nominations available.

5. It is desirable therefore that the provisionally selected mares should, in the first instance, be inspected by a member or members of the Committee, or by a person or persons appointed by them for the purpose. The mares should be approved for veterinary examination only if they are reported upon as suitable for the award of free nominations as regards general conformation.

6. When a sufficient number of mares has been so approved, arrangements should be made for their examination by a Veterinary Surgeon or Surgeons, appointed by the Committee for the purpose, at such times and place or places as may be convenient.

7. In order to avoid unnecessary expense, arrangements should as far as possible be made for a number of mares to be collected and examined at one place on one and the same day.

8. The Veterinary Surgeon is to make to the County Committee, on the form provided for the purpose, a confidential report as to each mare, and he will be required to give his certificate as to whether or not the mare is, in his opinion, fit for breeding purposes. His opinion is not to be communicated by him to the owner of the mare.

9. If the Veterinary Surgeon certifies that the mare is sound for breeding purposes, the County Committee may award a free nomination, if they think fit to do so.

10. If the Veterinary Surgeon certifies that a mare is not sound for breeding purposes no free nomination can be awarded for her.

11. An inclusive fee of 7s. 6d. will be paid by the Board for each

mare examined. An account of such fees is to be rendered to the Secretary of the County Committee, certified by him as correct, and then forwarded by him to the Board for payment. Forms of account for this purpose will be supplied by the Board to the Secretary of the Committee for transmission to the Veterinary Surgeon. The Veterinary Surgeon should be required to render his account at the same time as he makes his report. (H[13](a).)

County Committees for the Encouragement of the Horse-breeding Industry.

The President of the Board of Agriculture and Fisheries is appointing Committees in each county for the purpose of assisting the Board in all matters pertaining to the encouragement and improvement of the horse-breeding industry. The members of these Committeees are nominated by the Chairmen and Conveners of the County Councils, and are gentlemen having an intimate acquaintance with the industry of horse-breeding, and with their assistance and co-operation the Board hope to ascertain in the fullest manner all necessary details as to character and extent of the industry in the localities which they represent.

Among the Committees already appointed are the following:—

Cumberland.

G. J. Bell, 1 Lonsdale Street, Carlisle.
J. W. Brockbank, The Croft, Kirksanton, *viâ* Carnforth.
F. W. Chance, Morton, Carlisle.
Major Spencer Ferguson, 37 Lowther Street, Carlisle.
Henry Howard, Greystoke Castle, Cumberland.
John James, Manor House, Oughterside, Carlisle.
W. P. Moore, Whitehall, Mealsgate, Cumberland.
J. C. Toppin, Musgrave Hall, Skelton, Penrith.
Secretary, A. H. Macan, Greystoke, Cumberland.

Gloucester.

His Grace the Duke of Beaufort, Badminton, Glos.
The Earl Bathurst, C.M.G., Cirencester House, Cirencester.
Major the Hon. Lionel Byng, Avening, Stroud, Glos.
Colonel Sir Arthur Anstice, K.C.B., The Old Grange, Dymock, Glos.
M. W. Colchester-Wemyss, Westbury Court, Westbury-on-Severn, Newnham, Glos.
Colonel Frank Henry, Elmestree, Tetbury, Glos.
Colonel Marling, V.C., Sedbury Park, N. Chepstow.
Prof. Penberthy, F.R.C.V.S., Dean Hall, Newnham, Glos.
Evan T. Pritchard, Donnington Manor, Moreton-in-Marsh, Glos.
C. E. Turner, Old Down, Tockington, S.O., Glos.
Secretary, Captain M. F. Colchester-Wemyss, Broughtons, Newn-

Hereford.

Colonel P. L. Clowes, C.B., Burton Court, Pembridge, Herefords.
F. W. Barling, M.R.C.V.S., Bartestree Court, near Hereford.
John Bird, Livers Ocle, near Hereford.
Arthur E. Goodwin, Wilmastone, Peterchurch, Herefords.
Captain E. Heygate, Buckland, Leominster.
Captain R. L. Heygate, The Wells, Bromyard.
E. H. Landon, Bullingham, Hereford.
T. Raymond Symonds, How Caple Grange, Ross, Hereford.
Secretary, E. H. Landon, Bullingham, Hereford.

Isle of Wight.

Major-General Fetherstonhaugh, Gwydyr House, Ryde.
Lieut.-Colonel C. V. C. Hobart, D.S.O., West Cliff Hall, Hythe, Southampton.
Captain Collingwood Bertram, Yafford House, Shorwell, Isle of Wight.
James Attrill, Waytescourt, Brighstone, Isle of Wight.
Harry Jolliffe, Yafford House, Shorwell, Isle of Wight.
Dr. W. J. Jolliffe, Yafford House, Shorwell, Isle of Wight.
Secretary, Captain Collingwood Bertram, Yafford House, Shorwell, Isle of Wight.

Northampton.

The Lord Annaly, C.V.O., Holdenby House, Northampton.
James Brown, Earl's Barton House, Northampton.
John Cooper, Brook Hill, East Haddon, Northampton.
Wm. George, Gayton, Blisworth, Northants.
Wm. Murland, Badby House, Daventry.
O. C. Wallis, West Haddon Hall, Rugby.
Lieut.-Colonel H. Wickham, Barnwell Castle, Oundle.
Secretary, W. J. Peirce, Derngate, Northampton.

Rutland.

Captain the Hon. W. C. W. Fitzwilliam, C.V.O., Royal Mews, Buckingham Palace, S.W.
Major-General J. F. Brocklehurst, C.V.O., C.B., Ranksborough, Oakham.
John Maunsell-Richardson, D.L., J.P., Edmondthorpe Hall, Oakham.
John Northen, Thorpe-by-Water, Uppingham.
Secretary, G. E. Gibson, M.R.C.V.S., Oakham.

Salop.

A. E. Darby, Adcote, Shrewsbury.
R. C. Donaldson-Hudson, Cheswardine, Market Drayton.
G. H. Green, Wigmore Grange, Leintwardine, Herefordshire.
Captain H. Heywood-Lonsdale, Shavington, Market Drayton.
John Hill, Marsh Brook House, Church Stretton, Salop.
J. H. James-Moore, Aston Park, Wem, Shrewsbury.
Robert J. Mann, Wrenbury House, Nantwich.
Corbett Price, Leigh Hall, Minsterley, Shrewsbury.
R. Wilding, Ragdon, Church Stretton, Salop.
Secretary, Thomas Whitfield, Jun., 12 Talbot Chambers, Shrewsbury.

East Sussex.

His Grace the Duke of Devonshire, Devonshire House, Piccadilly, W.
Lord Henry Nevill, Eridge Castle, Tunbridge Wells.
The Hon. Charles Brand, Little Dene, Lewes.
Wm. Brown, Challoners, Rottingdean, Brighton.
Colonel Edward Frewen, *Brickwall, Northiam*, Sussex.
W. F. Ingram, 2 St. Andrew's Place, Lewes.
James Muggeridge, The Mount, Ditchling, Hassocks, Sussex.
Colonel R. H. Rawson, M.P., Gravenhurst, Haywards Heath.
R. J. Streatfeild, The Rocks, Uckfield.
Secretary, George E. Collins, 3 Albion Street, Lewes.

Staffordshire.

Sir R. P. Cooper, Bart., Shenstone Court, Lichfield.
Major Sir Lovelace Stamer, Bart., Betton House, Market Drayton.
W. W. Dobson, *Seighford Hall*, Stafford.
C. M. S. Hunter, Fisherwick, Lichfield.
R. G. Patterson, Acton Hall, Stafford.
Henry Toon, Greenhill Farm, Stone, Staffs.
R. S. Wilkinson, Swinchurch, Newcastle, Staffs.
R. N. Wood, Bignall End, Newcastle, Staffs.
Secretary, H. J. C. Winterton, Pipe Hill House, Lichfield.

West Sussex.

Lord Leconfield, Petworth House, Petworth.
Sir Merrik Burrell, Bart., Knepp Castle, Horsham.
Lieut.-Colonel C. B. Godman, Woldringfold, Horsham.
A. G. Hecks, Manor Farm, Sullington, Pulborough.
Secretary, J. B. Watson, Estate Office, Petworth.

Westmorland.

Major S. R. Fothergill, Lowbridge, Kendal.
W. Iliffe, F.R.C S., Natland, Kendal.
J. S. Rigg, Elm Bank, Appleby.
J. Wakefield, Sedgwick, Kendal.
C. H. Wilson, Oxenholme, Kendal.
Secretary, George Hoggarth, architect, &c., Kendal.

Worcester.

Major the Hon. C. J. Coventry, Earls Croome Court, Worcester.
Sir Harry Vernon, Bart., Hanbury Hall, Droitwich.
Frederick Ames, Hawford Lodge, Worcester.
Francis Checketts, Besford, Worcester.
Gerald Smith, Strensham Court, Worcester.
Colonel W. Stallard, St. John's, Worcester.
T. Lawson Walker, Knightwick Manor, Worcester.
Secretary, Colonel W. Stallard, St. John's, Worcester.

Yorks, East Riding.

The Lord *Middleton*, Birdsall *House*, York.
The Right Hon. the Lord Wenlock, G.C.I.E., G.C.S.I., K.C.B., Escrick Park, York.
T. Wickham Boynton, [illegible]

F. Reynard, Sunderlandwick, Driffield.
H. Whitworth, Scorborough Hall, Beverley.
Secretary, F. Reynard, Sunderlandwick, Driffield.

Brecknock.

The Lord Glanusk, Glanusk Park, Crickhowell, Brecknock.
Hugh A. Christy, Llangoed, Llyswen, Brecknock.
E. F. Cockcroft, Tyglyn, Hay, Hereford.
B. Davies, Beulah Lodge, Beulah, Garth, Brecknock.
W. S. Miller, Forest Lodge, Brecon.
Major Stuart Morgan, Bolgoed, Brecon.
Owen Price, Nantyrharn Cray, Brecon.
Chas. de Winton, Maesderven, Brecon.
Chas. Woosnam, Cefnllysgwynne, Builth Wells, Brecon.
Secretary, W. T. Isaac, Castle Farm, Brecon.

Carmarthen.

Thomas Davies, Tynycwm, Llansawel, Llandilo.
Delme Davies-Evans, Penylaw, Golden Grove, R.S.O., S. Wales.
Captain David Gwynne, Cilgwyn, Llangadock, Carmarthen.
R. H. Harries, The Croft, St. Clears, S. Wales.
Evans Jones, Manoavon, Llandilo, Carmarthen.
J. C. P. Vaughan Pryse-Rice, Llwynybrain, Llandovery, S. Wales.
Major C. Spence-Jones, Pantglâs, Golden Grove, S. Wales.
D. H. Thomas, Starling Park, Carmarthen.
J. Lloyd Thomas, Beach House, Ferryside, Carmarthen.
Secretary, G. E. S. Protheroe-Beynon, Trewern, Whitland, R.S.O., South Wales.

Denbigh.

Sir Watkin W. Wynne, Bart., Wynnstay, Ruabon.
Arthur E. Evans, Bronwylfa, near Wrexham.
Godfrey Fitzhugh, Plas Power, Wrexham.
T. Rogers Jones, Gorphwysfa, Llanrwst, Denbighshire.
Frank Lloyd, Eyton House, Wrexham.
Gomer Roberts, Cefn Griolen, Llandidan, Ruthin.
John Roberts, Plas Heaton Farm, Trefnant, Denbighshire.
R. H. Roberts, Foxhall, Henllan, Trefnant, Denbighshire.
Secretary, T. O. Bury, Regent Street, Wrexham.

Monmouth.

The Viscount Tredegar, Tredegar Park, Newport, Mon.
Colonel W. E. C. Curre, Itton Court, Chepstow.
Charles Knight, Slough Farm, Caerwent, near Chepstow.
W. R. Lysaght, Castleford, Chepstow.
T. J. Price, Gwynfa, Tredegar, Mon.
R. Stratton, The Duffryn, Newport, Mon.
Secretary, Gerald Vaughan-Hughes, Wyelands, Chepstow.

Radnorshire.

J. Bache, Stud Farm, Knighton, Radnorshire.
James Hamer, Greenfield, Penybont, Penybont Station, Radnor.
Chas. Coltman Rogers, Stanage Park, Br[illegible]

Captain Walter de Winton, Maesllwch Castle, Glasbury, Hereford.
Secretary, E. Percy Rogers, The Cave, Stanage Park, Brampton Brian, Herefordshire.

Argyll.

Bryce Allan, Jun., Aros, Tobermory.
Matthew Andrew, Drimvore, Lochgilphead.
Colonel H. Burnley Campbell, Ormidale, Colintraive.
James A. Hunter, Machribeg, Campbeltown.
J. Munro Mackenzie, Mornish, Calgary, Mull.
J. Maclachlan, of Maclachlan, Castle Lachlan, Strachur.
James Pender, Ardno, Lochgoilhead.
Ian Ramsay, Kildalton, Port Ellen, Isle of Islay.
H. Macdiarmid, Island House, Tiree by Oban.
Secretary, M. Sinclair, Lochgilphead.

Bute.

W. S. Miller, Glendermott, Craigmore, Rothesay.
Alex. McIntyre, Dunallan, Rothesay.
G. Laidler, Strabane, Brodick, Isle of Arran.
Secretary, A. W. Herbert, Clerk of the County Council, County Office, Rothesay.

Dumbarton.

Sir A. W. Leith Buchanan, Ross Priory, Balloch, Dumbarton.
John Christie, Levenfield, Alexandria, Dumbarton.
James Filshie, Mountpleasant, Old Kilpatrick, Glasgow.
W. Watson Murray, Catter House, Drymen, Glasgow.
Alexander Park, Ingleside, Lenzie, Glasgow.
James Snodgrass, Millig Farm, Helensburgh.
Secretary, Gavin Boyd, County Buildings, Dumbarton.

Renfrew.

Captain J. Gilmour, M.P., 1 Culford Gardens, London, S.W.
Geo. Barclay, Thornhill, Johnstone, Renfrew.
W. Clark, Netherlee, Cathcart, Glasgow.
J. Crawford, Mossend, Lochwinnoch, Renfrew.
H. E. Gordon, Aikenhead House, Cathcart, Glasgow.
D. Riddell, Blackhall, Paisley.
W. Taylor, Park Mains, Renfrew.
Secretary, James Caldwell, County Clerk, Paisley.

Names and Locations of King's Premium Stallions.

Particulars of the Location and Route of the Stallions to which King's Premiums were awarded at the Show held at the Royal Agricultural Hall, Islington, London, N., on March 7th, 8th, and 9th, 1911, together with the names and addresses of the owners of the Stallions, and of the members of the District Committees which have been appointed by the Board of Agriculture and Fisheries to supervise the service arrangements, are given in

District and Counties.	Stallion and Owner.	Location.	District Committee.
I. Aberdeen ... ... Banff ... ... Caithness ... ... Elgin ... ... Inverness ... ... Nairn ... ... Orkney ... ... Ross & Cromarty Shetland ... ... Sutherland... ...	**Likely Bird.** Mr. Fred Young, Duke Street, Chelmsford.	Stands at Elgin, and travels Elgin, Nairn, and Banff.	Mr. William Rose Black, Town and County Bank Buildings, Elgin (Corresponding Member). Mr. Alexander Brodie, Blackpots Tile Works, Banff. Mr. John A. Robertson, Royal Stables, Nairn.
	Money Spinner. Dr. A. O. Haslewood, Fairfield Stud, Buxton.	Stands at Inverurie, and travels Alford, Huntly, Turriff, Fraserburgh, Peterhead, Newburgh, and Aberdeen.	Mr. John E. Macqueen, 34 Bridge Street, Aberdeen (Corresponding Member). [Aberdeenshire. Mr. George Anderson, West Fingask, Old Meldrum, Mr. Alex. T. Gordon, Freefield, Insch, Aberdeenshire. Col. King, Tertowie House, near Kintore, Aberdeenshire.
II. Berwick ... ... Clackmannan ... Edinburgh... ... Fife ... ... Forfar ... ... Haddington ... Kincardine ... Kinross ... ... Linlithgow ... Peebles ... ... Perth ... ... Roxburgh ... ... Selkirk ... ... Stirling	**Tates.** Dr. A. O. Haslewood, Fairfield Stud, Buxton.	Travels in Fifeshire	Mr. William Blackie, Groveside, Upper Largo, Fife (Corresponding Member). Mr. James Cairns, Abercrombie, St. Monance. Fifeshire. Mr. Thomas Webster, *Nisbitfield, Collessie, Fifeshire.*
	Examiner. Mrs. Olive Howes, Hall Stud Farm, Litcham, Swaffham.	Travels in Forfarshire and Perthshire	Mr. W. Addison Scott, Newton of Arbirlot, Arbroath (Corresponding Member). Mr. Herbert K. Ogilvy, Auchterhouse, Dundee. Mr. Gavin Ralston, Glamis, Forfar.
	Red Hat. Buccleuch Hunters' Soc., Mount Hooly, Jedburgh.	Stands at Coldstream, and travels Ayton, Duns, Lauder, Earlston, and Kelso.	Mr. John Fulton, Hatchednize, Coldstream, Berwickshire (Corresponding Member). Mr. Thos. Calder, Mayfield, Reston, Berwickshire. Mr. G. H. J. Dove, Mellerstain, Kelso.

District and Counties.	Stallion and Owner.	Location.	District Committee.
III. Argyll ... ... Ayr ... ... Bute ... ... Dumbarton ... Dumfries ... ... Kirkcudbright ... Lanark .. ... Renfrew ... ... Wigtown	**Asian.** Mr. S. Mumford, Stud Farm, Moreton Morrell, Warwickshire.	Stands at Paisley, and travels North of Renfrewshire, Isle of Bute, and Kintyre districts.	Mr. William Taylor, Park Mains, Renfrew (Corresponding Member). Mr. James A. Hunter, Machribeg, Southend, Campbeltown. Mr. William S. Miller, Glendermott, Craigmore, Isle of Bute.
IV. Durham ... ... Northumberland Yorks, N. Riding	**Drummer Kelly.** Messrs. T. & W. Walton, The Stud Farm, Guisborough, Yorks.	*Stands at Guisborough, and travels* Lingdale, Easington, Whitby, Egton, Nunthorpe, Redcar, and Saltburn.	Mr. Joseph Hutchinson, Bank House, Guisborough (Corresponding Member). Major R. B. Turton, Kildale Hall, Grosmont, Yorks. Mr. W. H. A. Wharton, M. F. H., Skelton Castle, Skelton-in-Cleveland, Yorks.
	Skiograph. Major W. H. Fife, Langton Hall, Northallerton.	Stands at Langton Hall, Northallerton, and travels Northallerton, Bedale, Masham, Pickhill, Thirsk, Scotch Corner, Scorton, & Catterick	Capt. F. H. *Reynard, Camp Hill, Bedale*, Yorks. (Corresponding Member). Mr. J. F. Baker-Baker, Middleton Tyas, Yorks. Mr. Francis Samuelson, Breckenborough Hall, Thirsk.
	Red Hall II. Messrs. T. & H. Ward, Pinchingthorpe, Great Ayton, Yorks.	Stands at Pinchingthorpe, and travels Darlington, Staindrop, Stockton-on-Tees, Sedgefield, and Yarm.	Mr. C. H. Backhouse, c/o Mr. M. Knox, Barclay's Bank, Darlington (Corresponding Member). Mr. C. E. Faber, Stockton-on-Tees. Mr. R. G. Heslop, Selaby Farm, Gainford, Darlington.
V. Cumberland ... Lancaster ... ... Westmorland ...	**King Grouse.** Dr. A. O. Haslewood, Fairfield Stud, Buxton.	Stands at Wigton, and travels Aspatria, Penrith, Kirkoswald, Brampton, and Carlisle.	Mr. George J. Bell, 1 Lonsdale Street, Carlisle (Corresponding Member). Mr. R. Edwin James, Manor House, Oughterside, Carlisle. Mr. W. R. Mounsey, 20 King Street, Penrith.
	Red Heart. Mr. S. Mumford, Stud Farm, Moreton Morrell, Warwickshire.	Stands at Broughton, and travels Kirkham, Poulton-le-Fylde, Pilling, Lancaster, Carnforth, Ulverston, Garstang, and Preston.	Mr. Edward Bohane, Derby House, Winckley Square, Preston (Corresponding Member). Mr. James S. Fair, The Birks, Lytham, Lancs. Mr. Edmond Whinnerah, Warton, Carnforth, Lancs.
	Molière. Mr. T. J. Hillman, [illegible]	Stands at Warrington, and travels Newton-le-Willows, Leigh, Wigan, [illegible]	Mr. James Hamilton, Garswood Old Hall Farm, North Ashton, near Wigan (Corresponding Member). [illegible]

	Royal Bow. Messrs. Flannery Bros., Churchtown, Buttevant, Co. Cork.	Stands at Clitheroe, and travels Burnley, Bacup, Rochdale, Bolton, Haslingden, and Accrington.	Mr. Rowland Robinson, Gisburne, Clitheroe (Corresponding Member). Mr. J. Kerr Calderwood, M.R.C.V.S., Ingledale, Clitheroe. Mr. W. Garnett, Linton Croft, Clitheroe. Mr. John T. Pilling, The Thrums, Rochdale.
VI. Yorks, E. Riding, W. Riding	**Berrill.** Mr. H. A Cholmondeley, Sledmere, York.	Stands at Burton Agnes, and travels Bridlington, Driffield, and Hedon.	Mr. Frederick Reynard, Sunderlandwick, Driffield (Corresponding Member). Mr. John S. Chubb, Sledmere, York. Mr. B. C. Pennington, Estate Office, Burton Agnes, Driffield.
	Birk Gill. Mr. Eustace Barlow, Sigsworth, Pateley Bridge, Yorks.	Stands at Pateley Bridge, and travels Ripley, Harrogate, Knaresboro', Wetherby, Borobridge, and Ripon.	Mr. B. North, 31, Market Place, Ripon (Corresponding Member). Mr. T. Robinson, The Laurels, Wetherby. Rev. C. Slingsby, Scriven Park, Knaresboro'.
	Brummagem. Messrs. E. & P. Hodgson, Riding Fields Stud, Beverley.	Stands at Beverley, and travels Driffield, Brandesburton, Beeford, Hessle, and Newbald.	Mr. Frederick Reynard, Sunderlandwick, Driffield (Corresponding Member). Mr. J. Simons Harrison, Hurn Lodge, Beverley. Mr. E. Cecil Bainton, Red House, Beverley.
	Athos. Mr. T. L. Wickham-Boynton, Burton Agnes Hall, Driffield.	Stands at Burton Agnes, and travels Selby, Escrick, Tadcaster, and Boston Spa.	Mr. Henry Gill, 12, Chestnut Grove, Boston Spa, Yorks (Corresponding Member). Mr. Ben Day, The Rookery, Chapel Allerton, Leeds. Dr. G. Todd, 12, Park Street, Selby.
VII. Lincoln ... ... Notts	**Tydides.** Mr. S. Mumford, Stud Farm, Moreton Morrell, Warwickshire.	Stands at Nottingham, and travels Mansfield, Southwell, Newark, and Bingham.	Mr. Claude M. S. Pilkington, Wollaton, Nottingham (Corresponding Member). Mr. Oliver Quibell, Shalem Lodge, Newark-on-Trent. Mr. Charles Taylor, M.R.C.V.S., Lower Parliament St., Nottingham
	Royal Gard. Messrs. E. S. Tomlinson and C. J. Hill, Rauceby, Grantham.	Stands at Rauceby, and travels Sleaford, Lincoln, and Glentworth.	Mr. Frank A. Holmes, M.R.C.V.S., Hemswell, Lincoln (Corresponding Member). Mr. C. H. Morley, The Manor House, Brant Broughton, Newark. Mr. David Swanston, Ash Villa, Gainsborough.
	Volodya. Mrs. Olive Howes, Hall Stud Farm, Litcham, Swaffham.	Stands at Lincoln, and travels Bardney, Tattershall, Stickney, Wainfleet, and Billinghay.	Mr. F. St. B. Gregorie, 8 Banks Street, Lincoln (Corresponding Member). Mr. F. A. Holmes, M.R.C.V.S., Hemswell, Lincoln. Mr. Benjamin Rowland, Wainfleet, Lincs.

District and Counties.	Stallion and Owner.	Location.	District Committee.
VIII. Derby ... ... Stafford	**Ormeton.** Dr. A. O. Haslewood, Fairfield Stud, Buxton.	Stands at Buxton, and travels Bakewell, Derby, aod Ashbourne.	Mr. Sidney Burton, Canal Office. Derby (Corresponding Member). Mr. T. Hampson, 3, The Quadrant, Buxton. Mr. A. P. Payne-Gallwey, Castle Hill, Bakewell, Derbyshire.
	Ipswich. Sir W. A. H. Bass, Bart., Byrkley Lodge, Burton-on-Trent.	Stands at Byrkley Lodge, Burton-on Trent.	Mr. J. Beattie, Byrkley, *Burton-on-Trent* (*Corresponding* Member). Mr. Edwin Caldecott, The Firs, Foston. Derby. Mr. Wm. J. Nuttall, Park Hill, Chartley. Stafford.
IX. Chester ... ... Salop... ... ... Hereford	**Christmas Greeting.** Mr. T. J. Hillman, Stud Farm, Stock Word, Redditch.	Stands at Ludlow, and travels Leominster, Hereford, and Ledbury.	Mr. Edward H. Landon. Bullingham, Hereford (Corresponding Member). Mr. F. W. Barling, M.R.C.V.S., Bartestree Court, Nr Hereford. Sir Wm. M. Curtis, Bart , Caynham Court, Ludlow.
	Boss Roy. Dr. A. O. Haslewood, Fairfield Stud, Buxton.	Stands at Nantwich, and travels Whitchurch, Wem, Shrewsbury, Kinnersley, and Market Draytoo.	Mr. T. M. Parker. M.R.C.V.S., Whitchurch, Salop (Corresponding Member). Mr. Harry Mason, Kinnersley Manor, Wellington, Salop. Mr. Thomas Podmore, Oakley Park, Market Drayton.
	Chibiabos. Mr. W. Wilson, The Boro', Sanderstead, Surrey.	*Stands at Chester*, and travels Wirral District, Frodsham, Delamere Forest, and Tarporley.	Mr. W. Denson, Picton Hall, Chester (Corresponding Member). Mr. E. Greenway, M.R.C.V.S. Main Street, Frodsham, Ches. Mr. R. Parker, Gt. Stanney, Whitby, Chester
X. Flint ... ... Denbigh ... ... Merioneth... ... Montgomery ... Carnarvon... ... Anglesey ... ... Cardigan	**The Phœnician.** Mr. J. F. Rees, M.R.C.V.S., 22 Lammas Street, Carmarthen.	Stands at Glandyfi, and travels Aberystwyth, Tregaron, Lampeter, and Cardigan	Mr. D. Lloyd Lewis, National and Provincial Bank, Aberystwyth (Corresponding Member). [Cardiganshire. Sir Edward J. W. P. Pryse, Bart., Gogerddan, Bow Street, Lieut -Col. H. W. H. Brenchley, Glaneirw, Cardigan.
	Pedlar Brand. Mr. David Davies, M.P., M.F.H. Plas Dinam, Llandinam, Newtown, Mont.	Stands at Llandinam, and travels Newtown, Garthmyl, Wrexham, Llanymynech, and Welshpool.	Mr. Ernest C. Morgan, Crown Chambers, Newtown (Corresponding Member). Mr. Thomas Green, The Bank, Pool Quay, Welshpool. Mr. Richard Morgan, Snowfield, Kerry, Newtown.

XI. Radnor ... ... Brecknock ... ... Monmouth ... ... Glamorgan ... ... Carmarthen ... ... Pembroke	Mr. J. F. Rees, M.R.C.V.S., 22 Lammas Street, Carmarthen.	Stands at Carmarthen, and travels Llandilo, Llandyssil, Newcastle Emlyn, and Whitland.	Mr. G. E. Protheroe-Beynon, Trewern, Whitland, Carmarthenshire (Corresponding Member). Mr. David C. S. Gwynne, Cilgwgn, Llangadock, Carmarthenshire. Mr. D. H. Thomas, Starling Park, Carmarthen.
	Rockaway. Lord St. Davids, Lydstep Haven, Penally, Pembrokeshire.	Stands at Lydstep, and travels Narberth, Haverfordwest, and Pembroke.	Mr. John Griffiths, Lydstep Haven, Penally, Pemb. (Corresponding Member). Mr. David Evans, M.R.C.V.S., Haverfordwest. Mr. T. George Phelps, Cresselly, Begelly, Pemb.
	Coldstream. Mr. J. Staien, Bush Stud, St. Hilary, Cowbridge, Glam.	Stands at Cowbridge, and travels Neath, Brecon, Abergavenny, Monmouth, Cardiff, and Barry.	Mr. W. L. Jenkins, Cambrian House, Cowbridge, Glamorgan (Corresponding Member). Mr. A. M. Pilliner, J P., Llanyravon, near Newport, Mon. Mr. C. H. de Winton, M.F.H., Maesderwen, Brecon.
XII. Worcester ... ... Warwick ... ... Gloucester ... ... Oxford	**Ethelbruce.** Warwickshire Hunt Horse Show Committee, Kineton, Warwickshire.	Stands at Kineton, Warwickshire ...	The Lord Willoughby de Broke, Kineton, Warwickshire (Corresponding Member). Mr. C. L. Kendall, Walton, Warwick. Mr. James L. Wilkes, Tredington, Shipston-on-Stour, [Worcestershire.
	Snowflake. Mr. J. H. Parkes, Falcon Lodge, Sutton Coldfield, Warwickshire.	Stands at Sutton Coldfield, and travels Bromsgrove, Droitwich, Worcester, Whitacre, and Atherstone.	Mr. Alex. C. Fairweather, Moorland Cottage, Sutton Coldfield, Warwickshire (Corresponding Member). Mr. J. K. Bourne, Atherstone, Warwickshire. Mr. Robert Cottrill, Sandal Lodge, Droitwich.
	Thistledown. The Compton Stud, Sandley, Gillingham, Dorset.	Stands at Gloucester, and travels Berkeley Road, Stroud, Tetbury, Cirencester, and Tewkesbury.	Major the Hon. L. Byng, Avening House, Avening, Stroud (Glos.), (Corresponding Member). Mr. M. G. Lloyd Baker, The Cottage, Hardwicke, Gloucester. Col. F. Henry, Elmstree, Tetbury, Glos.
XIII. Leicester ... ... Rutland ... ... Soke of Peterboro' Northampton ... Hunts ... ... Bedford	**Drummond's Pride.** Mr. John Drage, Chapel Brampton, Northampton.	Stands at Chapel Brampton, and travels Market Harborough, Kettering, Thrapston, and Wellingborough.	Mr. Edward Messinger, Chapel Brampton, Northampton (Corresponding Member). Mr. James Brown, Earls Barton House, nr. Northampton. Mr. Herbert R. Roe, Cranoe, Market Harborough.
	Avico. Mr. R. H. Farmer, Chapel Brampton, Northampton.	Stands at Chapel Brampton, and travels Newnham, Daventry, Towcester, and Brackley.	Mr. James G. Lawrence, Red Lodge, Newnham, Daventry (Corresponding Member). Mr. J. L. Cross, Catthorpe, Rugby. Mr. E. C. Whitton, Woodford House, Woodford Halse, Byfield, [Northants.

District and Counties.	Stallions and Owners.	Location.	District Committee.
XIII. *Continued.* Leicester, &c. ...	**Blayney.** Dr. A. O. *Haslewood*, Fairfield Stud, Buxton.	Stands at Waltham-on-the-Wolds, and *travels* Melton Mowbray, Queni-*borough*, Leicester, Loughborough, Bottesford, and Grantham.	Mr. J. Frederic Cartmell, The Manor House, Kirby-Bellars, Melton Mowbray (Corresponding Member). Mr. R. C. Cooper, Waltham, Metton Mowbray. Mr. J. B. W. Robinson, Hoby, Leicester.
XIV. Norfolk ... ... Suffolk ... ... Cambs. ... ... Isle of Ely... ...	**Sea Bath.** Exors. of the late R. W. Palmer, Swafield Stud, North Walsham.	Stands at Swafield, and travels Aylesham, Norwich, Wymondham, and Dereham.	Mr. J. Barclay, Hanworth Hall, Hanworth, Norfolk (Corresponding Member). Rev. A. L. Fellowes, *Shotesham* Vicarage, Norwich. Mr. T. O. Springfield, Metton, Cromer, Norfolk.
	Handspring. Messrs. H. Arnold & O. Hudson, Crews Hill Paddocks, Enfield, Middlesex.	Stands at Barrow, and travels Cambridge, Bury St. Edmunds, and Ipswich.	Mr. E. A. Hudson, M.R.C.V.S., Barrow, Bury St. Edmunds (Corresponding Member). Mr. C. F. Cattle, Thurston, Bury St. Edmunds. Mr. W. N. Jurgensen, M.R.C.V.S., 30 Orford Street, Ipswich.
XV. Essex... ... ... Middlesex... ... Herts... ... ... Bucks...	***King's Courtship.*** Mr. D. Fraser. Tickford Park, Newport Pagnell.	Stands at Tickford Park Stud, Newport Pagnell.	Mr. Mark Grimes, Tickford Park Stud, Newport Pagnell (Corresponding Member). Mr. Francis W. Coales, Lothbury Newport Pagnell. Mr. Claud D. Pennant, Lillingstone Dayrell, Buckingham.
	Barkston Ash. Mr. H. Arnold, Crews Hill Paddock, Enfield, Middlesex.	Stands at Enfield, and travels Barnet, Hatfield, Stevenage, Hoddesdon, and Waltham Abbey.	Mr. John Bell, Cattlegate Farm, Enfield, Middlesex (Corresponding Member). Mr. A F. Bott, The Lordship, Bennington, Stevenage, Herts. Mr. J. C. McCowan, Hatfield, Herts. Mr. Frank E. *Ward*, *Manor* Farm, *Newnham*, *Baldock*, Herts.
XVI. Surrey ... ... Kent ... ... Sussex	**Hanover Square.** Sir Merrik R. Burrell, Bt., Knepp Castle, Horsham.	Stands at Knepp Castle, Horsham, and travels Petworth, Billingshurst, Ashington, Roffey, and Slinfold.	Mr. J. Mark Cazenove, Belmoredean, West Grinstead (Corresponding Member). Mr. Allan Leslie, Slindon, Arundel. Mr. Edward T. Norris, Gratwicke, Billingshurst.
	Pop Gun. Mr. T. C. Grantham, Capons Stud Farm, Cowfold, Sussex.	Stands at Cowfold, and travels East Sussex: Bolney, Cuckfield, East Grinstead, Haywards Heath, Burgess Hill, and Hurstpierpoint.	Mr. Edward T. Hodgson, Barnfield, Cowfold, Sussex (Corresponding Member). Mr. Horace Broad, *Ham Farm*, Hassocks, Sussex. Mr. Golding, Golding's Hotel, Hayward's Heath, Sussex.

XVII. Hants ... ... Berks ... ... Isle of Wight ...	**[illegible].** Dr. W. J. Jolliffe, Yafford House, Shorwell, I. of W.	Stands at Shorwell (I. of W.), and travels Isle of Wight.	Capt. H. Collingwood Bertram, Shorwell, Newport (I. of W.) (Corresponding Member). Mr. J. Attrill, Waytes Court, Brighstone, Newport. [I. of W. Maj.-Gen. R. S. Fetherstonhaugh, C.B., Gwydyr House, Ryde,
	Swagger. Mr. H. Arnold, Crews Hill Paddocks, Enfield, Middlesex.	Stands at Ascot, and travels Windsor, Maidenhead, Warfield, Reading, Mortimer, and Sandhurst.	Mr. R. C. Tennant, F.R.C.V.S., 57 Thames Street, Windsor (Corresponding Member). Mr. Arthur W. Hedges, Rayscourt, South Ascot, Ascot. Mr. D. White, Tompkin's Horse and Carriage Repository, Ltd., Friar Street, Reading.
XVIII. Wilts ... ... Dorset ... ... Somerset	**FitzDonovan.** Exford Horse Show Committee, Broomball, East Anstey, Dulverton, Som't.	Stands at Crown Hotel, Exford, Dunster, Somerset.	Mr. R. Thomas, Broomball, East Anstey, Dulverton, Som't. (Corresponding Member). Mr. P. Froude Hancock, Quarry Cleeve, Wiveliscombe, Som't. Mr. J. H. Turner, West Molland, South Molton, Devon.
	Ruadhsgeir. The Compton Stud, Sandley, Gillingham.	Stands at Sandley, Gillingham, and travels Yeovil, Shepton Mallet, and Frome.	Mr. W. Vizard, Castleton, Sherborne (Corresponding Member). Mr. A. C Clarke, The Red Lion, Shepton Mallet. Mr. Walter J. Pepperd. Sun House Farm, Yeovil.
	Golden Petrel. Mr. T. K. Bickell, St. John's Stud Farm, Lamerton, Tavistock, Devonshire.	Stands at Taunton, and travels Wellington, Wiveliscombe, and Bridgwater.	Mr. Charles L. Hancock, The Manor House, Cothelestone, Bishop's Lydeard, Taunton (Corresponding Member). Mr. J. C. Hally, M.R.C.V.S., Wellington, Somerset. Mr. John White, Lea Croft, Taunton.
XIX. Devon ... ... Cornwall	**Golden Grebe.** Messrs. W. & H. Whitley, Primley Farm, Paignton, Devonshire.	Stands at Paignton, and travels Newton Abbot, Totnes, Plympton, and East Cornwall.	Mr. David Japp, Strelna, Bovey Tracey, Devon (Corresponding Member). Mr. Charles Burleigh, Coldrenick Farm, Menheniot, Liskeard. Mr. Ernest W. Hawker, The Chantry, Ivybridge, Devon.
	Kano. Messrs. T. Yelverton & Sons, Otter Vale Stud, Venn Ottery, Ottery St. Mary, Devonshire.	Stands at Ottery St. Mary, and travels Exeter, Honiton, and Axminster.	Mr. C. L. Wilcocks, Streatham Farm, Exeter (Corresponding Member). Mr. William Marshall, Lengfield, Sidmouth Junction, Devon. Mr. W. B. Nelder, F.R.C.V.S., 33 Paul Street, Exeter.
	Harvest Money. Mr. F. R. Jeffery, Park Hill Stud Farm, Ipplepen, Newton Abbot, Devonshire.	Stands at Newton Abbot, and travels Tiverton, Okehampton, and Tavistock.	Mr. Mark W. Ball, Highclose, Newton Abbot (Corresponding Member). Mr. E. P. Northey, Higher Bowden, Okehampton, Devon. Mr. Frank Pring, Oburnford, Cullompton, Devon.

OFFICIAL NOTICES AND CIRCULARS.

The Board have received the following notice from the War Office:—

Money prizes are granted by the Secretary of State for War for Remount Classes at Horse Shows on the following conditions:—

Prizes for Remount Classes at Horse Shows.

1. Ages from 4 years off to 6 years off.

2. Height:—

		Hds.		Hds.
Chargers	...	14·3½	to	16·1
Troop Horse Class	Household Cavalry Horses (Black)	16·0	,,	16·1
	Cavalry	15·1½	,,	15·3
	Artillery	15·2	,,	16·0
	Draught	15·2	,,	16·0
	Cobs	14·2	,,	15·0½

The minimum heights will, except in very special cases, apply only to four years (and under), ½ in. to be allowed for shoes.

3. The maximum prices paid for the above classes are:—

Chargers ...	£60
Household Cavalry Horses (Black)	65
Cavalry ...	40
Artillery ...	42
Light Draught	40
Cobs ...	30

No horse is to be shown in two classes.

4. Only undocked horses are accepted for Cavalry.

5. The selling price of any horse entered must not exceed the maximum price mentioned in 3 according to class. Horses entered in these classes can be claimed by the Army purchaser at that price, but nothing in these conditions shall bind him to purchase a horse or to give the maximum price.

6. All horses must be the *bona-fide* property of farmers and breeders in the district in which the show is held. The classes for which prizes will be offered will vary according to the districts, so as to encourage breeders to show local-bred horses. The prizes will be withheld unless the total number of entries in a class amounts to ten. Before being awarded a prize the horse must be passed sound by a veterinary surgeon accredited by the Remount Department. All horses entered in the Troop Horse Classes (*i.e.*, Household Cavalry, Cavalry, Artillery, Draught, Cobs) must be quiet enough to handle and run quietly in hand. Horses in Charger Class must be shown under saddle.

7. Light, washy-coloured, or "mealy" horses are not desired.

8. All horses intended for military purposes should be true, level movers; those for riding purposes should also be short-backed, compact horses, with good riding shoulders and capable of carrying weight.

9. The *Cavalry Troop Horse* must be able to carry at least 16 stone under service conditions, which necessitate continuous marching at a walk and trot, and occasionally manœuvring at a gallop.

The *Cob* is required to carry 14 stone under similar conditions.

The *Artillery Draught Horse* required for guns must be active and fit to carry a man riding postillion, to trot nine miles an hour with a load, and to gallop on favourable ground.

10. The Committee are requested to give to the officer deputed by the Director of Transport and Remounts to attend the show such facilities as they can, thoroughly to inspect and examine the horses for competition. The payment of the prize money will be subject to the condition that the Remount Officer concurs in the award of the Committee, in so far as relates to the suitability of the horse to the purpose of the various arms of the service.

11. Subject to the above, the prize money is placed at the disposal of the Committee to apply to two or more prizes, as may be considered most suitable to the district in which the show is held.

Outbreak of Foot-and-Mouth disease in Surrey.

A report of suspected foot-and-mouth disease at Chobham, Surrey, was received by the Board on March 9th, 1911. The Board's Chief Veterinary Officer visited the premises on March 10th, and found that six cattle and three swine were affected. On the same date the Board issued an Order prohibiting the movement of all animals over a wide area around the seat of the outbreak, and Local Authorities throughout Great Britain were warned that the disease had reappeared in this country.

The slaughter of all the animals on the infected premises and of other animals which had been exposed to infection was completed on March 13th; 25 head of cattle, 7 swine, and 165 sheep were slaughtered, of which 15 cattle and 3 swine were found to be affected with the disease. The Board made an Order on March 14th, which took effect from March 16th, allowing the movement into the Scheduled District by railway, under certain conditions, of animals intended for immediate slaughter.

No further case of foot-and-mouth disease having been detected in the locality of the premises at Chobham, the Board made an Order on March 18th, further modifying, as from March 23rd, the restrictions on the movement of animals in the Scheduled District, and on the 28th issued an Order to come into operation on April 1st reducing the area under restriction.

Departmental Committee on Changes in Ownership of Land.

The President of the Board of Agriculture and Fisheries has appointed a Departmental Committee to inquire into the position of tenant farmers in England and Wales on the occasion of any change in the ownership of their holdings, whether by reason of the death of the landlord, the sale of the land, or otherwise, and to consider whether any legislation on the subject is desirable.

The committee will be constituted as follows:—The Right Hon. the Lord Haversham (Chairman), the Lord Clinton, Lord Ninian E. Crichton-Stuart, M.P., Sir Frederick Cawley, Bart., M.P., Sir Charles D. Rose, Bart., M.P., Sir Edward H. Holden, Bart., Mr. Colin Campbell (Chairman of the Lincolnshire Farmers' Union), Mr. Ellis W. Davies, M.P., Mr. H. Trustram Eve, F.S.I. (Secretary to the

Farmers' Club), Mr. Howard Frank, Mr. George Nicholls, and Mr. Abel H. Smith.

Mr. Edwin Lawrence Mitchell, of the Board of Agriculture and Fisheries, will act as Secretary to the Committee.

The President has since appointed Captain A. G. Weigall, M.P., and Mr. James Parker, M.P., to be additional members of the Committee.

Destruction of Wood Pigeons.

In view of the complaints which have been received by the Board of Agriculture and Fisheries as to the depredations which have recently been committed by wood pigeons, the Board issued a notice early in March suggesting to landowners, farmers, and gamekeepers that they should make a combined effort in the fortnight beginning March 20th to reduce the numbers of the pigeons in their neighbourhood.

It is probable that many of these birds are migrants and had not then settled in any district, so that if the steps suggested by the Board were taken many of the pigeons attacking crops may have been prevented from settling in the district, even if a large number of birds were not shot.

A special attempt should be made to shoot pigeons late in the evening, so as to drive them from the woods or other cover in which they roost.

Recent Leaflets.

The following is a list of leaflets which have been recently issued: No 235, The Organisation of the Milk Supply; No. 236, Thatching; No. 237, Redwater in Cattle; No. 238, Leaf Diseases of Celery; No. 239, The Pear Leaf Blister Mite; No. 240, Farm Book-keeping; No. 243, Strawberry Leaf Spot; No. 244, The Destruction of Rats; and No. 247, Shot-hole Fungus.

New editions of the following leaflets have been prepared, the information having been substantially revised:

No. 4, *Winter Moths.*—Information as to remedies against the caterpillars has been amplified.

No. 12, *Gooseberry Saw-fly.*—An illustration of the eggs of the saw-fly has been added.

No. 28, *Anthrax.*—This has been revised to include the provisions of the Anthrax Order of 1910.

No. 104, *Aphides or Plant Lice.*—Descriptions of, and remedies for, aphides on the bean, cabbage, rose, and plum are now given.

No. 105, *Wart Disease (Black Scab) of Potatoes.*—Fresh illustrations are given, with notes as to the susceptibility of different varieties of potatoes to the disease.

No. 106, *Fertilisers for Market Garden Crops.*—Advice as to the manuring of currants, raspberries, plums, and apples has been included.

No. 112, *Weeds and their Suppression.*—The methods of suppression by the growth of "smother" crops and spraying are now mentioned.

No. 114, *The Feeding of Poultry.*—This leaflet has been almost entirely rewritten.

No. 137, *Varieties of Scab in Potatoes.*—The title of this leaflet has been altered in order to include information on scab due to mechanical injury, and scab caused by millipedes. Corresponding illustrations are given.

No. 166, *Some Common Thistles.*—Descriptions and illustrations, together with advice as to extermination of the Stemless or Dwarf Thistle, the Annual Sow Thistle, and the Perennial or Corn Sow Thistle have now been included.

No. 179, *The Making of Soft and Cream Cheeses and Clotted Cream.*—This has been rewritten, the original leaflet of six pages having been extended to sixteen pages in length by the inclusion of information as to Camembert, Brie, and Pont l'Évêque cheeses.

No. 218, *Associations for the Creation of Small Holdings.*—This leaflet has been rewritten.

Leaflets in Gaelic.—For the benefit of Gaelic-speaking inhabitants of the northern parts of Scotland, the Board have caused two leaflets to be translated into that language, viz., No. 119, Sturdy or Gid in Sheep; and No. 126, Sheep Maggot Fly.

Warning as to the Sale of Low-Quality Manures at Excessive Prices.—A pamphlet has been recently issued warning agriculturists against purchasing manures of low quality at prices far above their real value.

Copies of any of the above leaflets can be obtained on application to the Secretary, Board of Agriculture and Fisheries, 4 Whitehall Place, London, S.W.

General Index to the Journal.

A General Index to Vols. XI.-XVII. (April, 1904, to March, 1911) of the *Journal* is issued with this number, price 4*d*. post free.

A similar General Index, covering the first ten volumes of the *Journal*, has also been issued, and copies may be obtained from the Offices of the Board, price 1*s*. each, post free.

MISCELLANEOUS NOTES.

Importation Regulations.

Importation of Dogs into Australia.—A Proclamation, dated December 22nd, 1910, prohibits, under the Quarantine Act of 1908, the importation of dogs into the Commonwealth from all parts of the world, except the United Kingdom and New Zealand, with effect from March 31st, 1911.

Dogs for scientific or exhibition purposes may, however, be imported by permission of the Minister under such conditions as may be imposed in the permit. (*Board of Trade Journal*, March 2nd, 1911.)

Importation of Potatoes into Australia.—A Proclamation, dated December 22nd last, prohibits the importation of potatoes from any country into the Commonwealth, unless they are accompanied by an official certificate dated and signed by a responsible officer of a Government Department of the country of origin, identifying the potatoes, specifying the quantity, and certifying, *inter alia*, that they were free from the disease caused by *Phytophthora*

infestans at the date of the issue of the certificate. (*Board of Trade Journal*, March 2nd, 1911.)

Restrictions on Importation of Hay and Straw and of Ruminating Animals and Swine into Ireland from Great Britain.—As a precaution against the introduction of foot-and-mouth disease the Department of Agriculture and Technical Instruction for Ireland have issued an Order prohibiting the landing in Ireland of hay and straw from Great Britain.

The Order does not, however, apply to

(*a*) hay or straw which at the time of importation is being used for packing merchandise; or

(*b*) manufactured straw not intended for use as fodder or litter for animals; or

(*c*) hay or straw which is authorised to be landed for use otherwise than as fodder or litter for animals by a licence granted by an Inspector of the Department, which licence shall contain such conditions as in the opinion of the Department are necessary to prevent the introduction of disease by the hay or straw.

All importations from Great Britain of cattle, sheep, goats, and other ruminating animals and swine have been suspended, but horses, asses, or mules may be imported if accompanied by the necessary permit from the Department.

Prohibition of Importation of Live Stock from England.—In consequence of the recent outbreak of foot-and-mouth disease in Surrey, the importation of live stock (excluding horses) from the United Kingdom has been prohibited by the Governments of Argentina, Uruguay, Union of South Africa, and Holland.

Prohibition of Importation of Hay, Straw, and Manure into France.—A decree of the French Ministry of Agriculture of February 20th, 1911, prohibits the importation into, or transit through, France of foreign hay, straw, and manure. It is stated that the decree has been rendered necessary by the prevalence of foot-and-mouth disease in many countries. (*Journal Officiel*, February 22nd, 1911.)

Importation of Potatoes into Jersey.—The States of the Island of Jersey have adopted an Act authorising the importation of potatoes from certain districts in Scotland from March 25th to May 31st inclusive, on the following conditions:—

1.—The potatoes imported must form the sole cargo on the vessel, and must come direct from the district where they were grown to be sent to Jersey direct from the port of landing.

2.—Each cargo must be accompanied by a solemn declaration by the shipper attested by a Notary or Commissioner of Oaths, giving the place of origin of the potatoes, and certifying that they have not been grown in land or soil affected by Wart Disease of potatoes.

3.—Each cargo must also be accompanied by a certificate of the Board of Agriculture and Fisheries to the effect that the district in which the potatoes were grown is free from disease.

Intending exporters of potatoes to Jersey should, when applying to the Board for a certificate, forward the declaration from the grower of the potatoes referred to above. The declaration should state the parish in which the potatoes were grown.

Agricultural Congresses Abroad.

The fifth International Dairy Congress, organised by the Swedish Committee of the International Dairy Federation, will be held this year at Stockholm, from June 28th to July 1st.

The International Dairy Congress has now met four times, and will probably continue to meet regularly in alternate years. The initiative was taken by the National Dairy Society of Belgium, which organised a semi-official conference at Brussels in 1902, when the Belgian Government was invited to submit to the Governments of the various foreign countries interested in the butter industry a proposal to summon an international congress with a view to adopt a common basis of legislation for the prevention of the exportation of adulterated butter.

The Belgian Government did not take any direct action in the matter, but, under its auspices, the Belgian Society subsequently organised the first International Dairy Congress, which was held at Brussels in September, 1903. One result of this congress was the formation of the International Dairy Federation. The permanent committee of the Federation, which is an unofficial body, now meets periodically at Brussels, and it includes members representing nearly twenty different countries.

The second congress was organised by the French committee of the International Dairy Federation, and it was held under the auspices of the French Government, which gave its official recognition by voting a special parliamentary grant towards the expenses, and by inviting foreign countries to send official delegates. The third congress, organised by the Netherlands committee, was held at The Hague in 1907, and the fourth, organised by the Hungarian committee, was held at Budapest in 1909.

Communications relating to the congress may be addressed to Mr. Lloyd Baker, Hardwicke Court, Gloucester.

Poultry Keeping Congress at Orono, Maine.—The Board are informed that the fourth annual meeting of the International Association of Instructors and Investigators in Poultry Husbandry will be held in July at the Maine Agricultural Experiment Station, Orono, Maine, U.S.A. The operations of the society have hitherto been confined to the United States and Canada, but it is sought to give the coming meeting more of an international character by inviting poultry experts from Europe and elsewhere. The Secretary of the Association is Professor J. E. Rice, of Cornell University, Ithaca, New York, U.S.A.

Notes on Agriculture Abroad.

The Cotentin Breed of Cattle.—The Board have received through the Foreign Office some information which was supplied to the British Consul-General at Havre by the Director of the Havre Natural History Museum respecting the Cotentin breed of dairy cattle.

The Cotentin breed is found in part of the old province of Normandy, principally in the neighbourhood of Carentan, Isigny, and Gournay. This region possesses grass lands of medium quality, and the climate, which is nearly always damp, is favourable to the

production of milk. The locality is particularly well known for the remarkable quality of the butter which is produced in abundance there. For these reasons the cattle of this district consist mainly of cows, the males being sent while young to other parts of Normandy. Cows are often found to yield over 1,300 gallons of milk between two calving seasons. The milk is chiefly remarkable for its richness, containing on the average 5·622 per cent. of butter fat. The butter made from this milk is celebrated for its flavour and aroma. During the last twenty years the breed has been much improved, and a herd book has been established.

Agriculture and Dairying in Queensland.—The Imperial Trade Correspondent, in a report to the Board of Trade dated January 2nd, states that the pastoral, dairying, and agricultural industries are in a flourishing condition throughout Australia. In Queensland, stocking up of cattle and sheep has taken place in all the holdings, and the carrying capacity of the stations seems likely to be as great as before the drought of 1901–3. The butter industry in Queensland has, until quite lately, been confined practically to the southern parts of the State; but, owing partly to the mild winters and copious rains in the north, the industry has begun to extend northwards, and may be carried on as far north as Cairns and Cooktown.—(*Board of Trade Journal*, February 23rd, 1911.)

Live Stock in Argentina.

Breeds of Live Stock.—According to the Argentine Agricultural Census, the total number of cattle in the Republic in 1908 was 29,116,625. The total number of bulls of ascertained breed was returned at 368,888, breeding cows at 7,270,936, and milch cows at 927,279. Classified according to breed (whether pedigree, pure cross-bred, or half-bred) these cattle are distributed as follows:—

Shorthorn	7,385,880
Hereford...	553,555
Aberdeen Angus ...	125,829
Red Polled	1,702
Jersey	2,076
Flemish	2,844
Swiss	2,401
Dutch	21,164
Unclassified	471,652
	8,567,103

The number of horses in the Repuhlic is given as 7,531,376; of these 49,000 are pure-bred, 1,693,637 half-bred, and 5,788,739 native. The chief breeds of pure- and half-bred horses are Percherons with 254,357 head; Clydesdales, 225,643; Normandy, 69,434; and Hackneys, 47,736.

Since the last census was taken (1895) there has been a decrease in the number of sheep of 7,167,808 head. This is to be attributed to the growth of agriculture in the provinces of Buenos Aires, Santa Fé, and Cordova. The number of sheep in 1908 was 67,211,754, of

Rambouillet...	8,961,267
Negrete or Black-face	388,938
Lincoln	18,307,216
Southdown	300,209
Shropshire	304,950
Leicester	90,488
Other breeds and not specified ...	6,268,510

The total number of swine is stated to be 1,403,591; of these 34,462 were pure-bred, 589,126 half-bred, and the rest native. The number of those of English breeds was as follows:—Berkshire, 69,491; Leicester, 21,129; and Yorkshire, 62,455.

Importation of Pedigree Live Stock.—Particulars as to importation were recently given in this *Journal*, May, 1910, p. 130, but it is computed in the Census that during the four years 1905–8 the sheep-breeding industry alone contributed the sum of £500,000 to English breeders for the purchase of pure-bred stock. It may also be mentioned that of 16,156 head of pedigree cattle imported into Argentina from 1880 to 1907, 14,624 came from the United Kingdom, while of 71,488 pedigree sheep imported during the same period 65,724 came from the United Kingdom.

The inspection of imported live stock is under the control of the Live Stock Division of the Department of Agriculture. Veterinary inspectors are maintained at the ports, and the two diseases for which tests are chiefly made are tick and tuberculosis, eye and skin tests being made for the latter disease. The bulk of the live stock imported comes from Uruguay, and importation takes place mainly through the river ports. Importation through the port of Buenos Aires is confined almost exclusively to European pedigree animals, and elaborate arrangements are made for their reception and examination. A large building has been erected close to the dock, provided with all sanitary appliances, in which the animals are housed for the period required by the quarantine regulations (cattle, 30 days, horses, 8 days).

Meat Industry of the Argentine Republic.—It is calculated that the average annual consumption of live stock in the Republic amounts to 2,700,000 cattle, 5,500,000 sheep, and 150,000 pigs. Of these about 922,000 cattle, 3,289,000 sheep and 6,000 pigs pass through the freezing factories annually for purposes of exportation.

The first establishment for preserving meat was founded in 1883; by 1907 the number of freezing, &c., factories had risen to 26. In this year the exports of chilled and frozen beef amounted to 148,000 tons, and of frozen sheep and lambs to 70,000 tons.

Notes on the Weather in March.

The weather during the *first* week (February 26th to March 4th) was very unsettled, with frequent falls of rain over the greater part of the country, but with occasional intervals of clear sky. Unusual warmth was experienced everywhere, the excess over the normal being about 6½° in England E. and Midland Counties, about 6° in England N.E. and N.W., and more than 4° in almost all other parts of the country. Rainfall was "heavy," except in Scotland E. and England N.E., but even in the former district it

was above the normal. Bright sunshine was "moderate" in England E., S.E., N.W., and S.W., and "abundant" elsewhere.

The conditions continued unsettled during the *second* week. Rain was less frequent in the southern and midland districts of England than in other parts, and heavy falls were recorded in Scotland N. and England S.W. Fair or bright intervals were experienced in all parts of the country, and only in England S.E. was the amount of sunshine classed as "scanty." Warmth was everywhere "moderate," being a trifle below the average in England S.E. and S.W., and slightly above it elsewhere.

Early in the *third* week rain, sleet, or snow fell in almost all parts, the rain being heavy in the south and south-west of England. Later in the week the weather in the west and north-west was generally dry, though seldom very bright, while occasional precipitation continued in the east and south. Warmth was "deficient" in England S.W., and "moderate" elsewhere, though the temperature generally was below the average. Bright sunshine was "scanty" over England, except in England N.W. and S.W., where it was "moderate"; it was above the average, however, in Scotland N. and W.

As a whole, the conditions during the *fourth* week were drier in the north and west than in the south and south-east, especially in Scotland and the north-west of England. Showers and squalls of snow were experienced in most localities in Great Britain late in the week. Taking the whole week into consideration, however, the rainfall was less than the average except in two districts, viz., England E. and S.E. Bright sunshine varied greatly in different localities, but over the major part of the country it was below the normal. Temperature was "deficient" over Scotland and in England N.W., and "moderate" over the rest of England, being above the average in England S.E.

Notes on Crop Prospects Abroad.

The International Agricultural Institute, in its Bulletin of Agricultural Statistics for March, 1911, reports that the condition of the autumn and winter crops was generally good in the following countries:—Belgium, Denmark, Spain, France, Great Britain, Hungary, Luxemburg, Netherlands, Roumania, Sweden, Tunis, and Japan. With regard to certain other countries the following information is given:—

Bulgaria.—The crops have been exposed to sharp frosts, but the damage has been small, except in the case of barley, which is in a less satisfactory condition than the other cereals.

Russia in Europe.—In the greater part of European Russia there were no sharp frosts until the middle of December. From December 20th onwards the frosts were more severe, but at about the same time a greater quantity of snow fell, and by February 1st the majority of the fields were well covered. The present condition of the autumn crops in Russia in Europe is about the same as on November 1st, 1910.

Italy.—Exceptionally cold weather and heavy falls of snow have considerably damaged the crops on the areas descending towards the Adriatic and Ionian coasts in southern Italy. In northern Italy, how-

ever, and in the provinces bordering the Tyrrhenian Sea, with the exception of the southern regions of the Appenines, the condition of the crops is in general good to very good.

Spring sowing was stated to be progressing under favourable conditions in Spain, France, Great Britain, Croatia and Slavonia, and Roumania.

British India.—The second official memorandum on the wheat crop states the area to be 28,973,000 acres, thus showing an increase of 3·4 per cent. as compared with last year's area. The general condition of the crop in the middle of March was good.

World's Wheat Crop.—The world's wheat crop in 1910 is estimated by *Dornbusch's Evening List* of March 8th, 1911, at 458,580,000 qrs. (measured), as compared with 453,711,000 qrs. in 1909, 396,213,000 qrs. in 1908, and 388,316,000 qrs. in 1907.

Failure of Potato Crop in France.—The British Acting Consul-General at Havre (Mr. J. Walsh) reports that, owing to the poor potato crop in France, it has been necessary to import supplies, and quantities are arriving weekly at Havre from Hamburg and Rotterdam. (*Board of Trade Journal*, March 16th, 1911.)

Crop Conditions on April 1st.

The Crop Reporters of the Board, in reporting on agricultural conditions in March, indicate that there is little more to be said regarding the appearance of the winter wheat crop than was reported last month, the early sown still looking better than that put in later in the autumn. The weather during March was generally cold, and vegetation accordingly made comparatively little progress. The total area placed under wheat for the 1911 harvest is probably about 5 per cent. more than that of 1910; this increase is practically all in the eastern half of the country, while in the west there may even be a small decrease.

Owing to the cold and often wet weather which prevailed during most of the month, progress in sowing the spring crops has in many districts not been so rapid as is usually the case. Consequently in many parts of the country the season may be now regarded as rather a backward one; but the delays have hardly had so serious an effect as the work was well forward at the beginning of March. Work is more advanced, nearly everywhere, on light than on heavy soils. Progress has been more satisfactory in the north-west of England and in Scotland than in the south. The appearance of both barley and oats, where showing above ground, is quite satisfactory.

In most parts of England only the early varieties of potatoes had been planted. This work was, however, at the date of these reports, in full swing in some of the more important districts of Lincoln. In Ayrshire, and in the neighbouring counties the work was very forward, and in some localities even nearly finished, while good progress is reported from the eastern potato districts of Scotland. In Lancashire little appears to have been done.

The fall of lambs, from those counties where lambing took place in March, has generally proved to be about average; while the lambs

themselves are strong and healthy as a rule, but have been considerably tried by the unfavourable weather. The poor condition of the ewes, with consequent ill effects to the young lamb, is reported from many districts, this being ascribed to the check given by the cold weather to the growth of grass.

Agricultural Labour in England during March.

Employment was generally regular during March, though in some districts, more particularly in the north and east, rain caused some loss of time to men outside the ordinary farm staff. Day labourers were chiefly wanted for threshing, hedging, and carting manure, and, except where rain interrupted work, the demand was usually sufficient to absorb the supply. Men for permanent situations, especially milkers, were again reported as scarce in parts of the Midland and Southern and South-Western Counties.

Northern Counties.—Employment was fairly regular in these counties, and there was an improved demand for extra labourers. Some of these men lost time in the middle of the month through stormy weather, but otherwise the supply of and demand for men of this class were generally about equal, an excess of such men being reported only in the Clitheroe Rural District in *Lancashire*, and in the Shirburn and Bridlington Rural Districts in *Yorkshire*. They were chiefly employed in threshing, carting manure, and hedging. No change in wages was reported at the *Northumberland* hiring fairs, which took place in March.

Midland Counties.—Threshing, carting manure, hedging, ditching, planting potatoes, and preparing the land for sowing caused a fair demand on the whole for extra labourers in these counties, though the demand was occasionally affected by wet weather in some districts, more particularly in *Oxfordshire, Buckinghamshire, Hertfordshire,* and *Bedfordshire*. There was a sufficient supply of extra men as a rule, but men for permanent situations were again reported as scarce in certain Rural Districts.

Eastern Counties.—In many districts in these counties the demand for extra labourers was a good deal reduced on account of wet weather, which delayed spring sowing, and hindered other work, such as threshing. The supply of these men was generally sufficient for requirements, though some scarcity was reported in the Wilton (*Lincolnshire*) Rural District, and a surplus was reported in the Linton and Wisbech (*Cambridgeshire*), Thetford (*Norfolk*), Thingoe (*Suffolk*), and Ongar (*Essex*) Rural Districts. A scarcity of milkers and shepherds was reported in the Brigg (*Lincolnshire*) Rural District.

Southern and South-Western Counties.—There was generally but little interruption from the weather to outdoor work in these counties. Spring sowing was delayed in some districts by the wet state of the land, but extra labourers were usually in demand for other work, such as threshing, hedging, carting manure, &c., and the supply of men was usually accounted for; this was not the case, however, in *Kent*, where a surplus was reported in the Faversham, Hollingbourne, and Hoo Rural Districts. A scarcity of men for permanent situations was

THE CORN MARKETS IN MARCH.

C. KAINS-JACKSON.

A medium retail business continues to be done on the British grain and flour markets, but trade generally is depressed. The factor which influences the spot markets more than any other circumstance is the supply on passage. This on the last day of the month was close upon four million quarters of wheat, nearly nine hundred thousand quarters of oats, and about a million quarters of feeding barley, maize, oil beans, and peas. Of brewing barley 300,000 qrs., and of linseed 150,000 qrs. were on passage, but these totals were covered by buying, and, at very moderate concessions to purchasers, could be placed.

Wheat.—The imperial average has had some difficulty in keeping on the right side of thirty shillings. Some very low averages from markets between Humber and Tweed have been recorded, but the better rates made in the Home Counties have sufficed to redress the balance. Imported wheat has been pressed on sale at fully a shilling decline on the month, and some sorts have been offered at eighteen-pence reduction. The new crop in India appears not only to be a large one, but to be an early harvest; in March, 1910, 111,000 qrs. were shipped, but this year the month's clearances were 471,000 qrs. It is, however, probable that most of this was old wheat sold cheaply ex silo in order to leave room for new crop coming in. Prices ruling at the end of the month for the leading sorts from abroad were:—37*s.* to 37*s.* 9*d.* for the best Canadian; 35*s.* to 35*s.* 3*d.* for No. 4 Manitoba; 34*s.* 6*d.* to 35*s.* for Indian white; 34*s.* to 34*s.* 3*d.* for Indian red; 36*s.* to 36*s.* 3*d.* for Australian; 36*s.* to 36*s.* 9*d.* for the finest Russian, such as Saxonka and best Polish, and 32*s.* to 33*s.* for common Russian. March shipments were as follows:—North America, 575,000 qr.; South America, 1,355,000 qr.; Russia, 1,581,000 qr.; Europe S.E., 407,000 qr.; and Australasia, 919,000 qr.

Flour.—An increased demand for all-English flour has been a feature of the month. It is more vigorous in London and other cities than in the rural districts, which are sending in considerable quantities by rail, some also by road. These latter supplies do not appear in any lists of arrivals. The price is 24*s.* 6*d.* to 25*s.* for the flour delivered up to London goods station, 23*s.* 6*d.* in the country. There is little change in London-made Standard or 80 per cent. flour, roller-ground. At the end of the month 27*s.* was asked, but the new sort has not yet the fixed level of Town Whites and Town Households, for which on the 27th the London Millers' Association agreed to quote 30*s.* 6*d.* and 27*s.* 6*d.* respectively. These Association prices include credit and delivery, and are 1*s.* to 1*s.* 6*d.* above the price for cash ex mill. Wholemeal has had a good sale at 26*s.* per sack. Hungarian flour has been a slow, firm trade at 38*s.* per sack.

Barley.—There has been a fair demand for seed, but prices cannot be said to have ruled high even for fine samples. Less than usual has been doing in brewing and distilling grades. A good supply of Californian is expected to come on sale between Easter and mid-May, and 30*s.* is about the price for fair average quality, 448 lb. weight. The Russian feeding barley which has been quoted at 20*s.* 6*d.* to 21*s.*

has not sold briskly; nevertheless, value has been fully maintained, the month's imports being below an average. Shipments for March were 75,000 qrs. from North America, 561,000 qrs. from Russia, and 219,000 qrs. from Europe S.E.

Oats.—An excellent demand for seed oats ruled all through the month. Winter oats have lasted well this season, and are still to be had in fair quantity at 19*s.* to 20*s.* per 336 lb. Ordinary Tartary oats have made 19*s.* to 20*s.* for white, 18*s.* to 19*s.* for black. Imported oats have not been so plentiful as usual, and prices are fully 6*d.* dearer on the month. New Zealand sorts have made 20*s.* to 21*s.* per 320 lb., Russian 18*s.* to 19*s.* for the like weight. Common Russian and Argentine closed at "a full" 14*s.* 6*d.* for cash. These oats are of very poor natural weight, but are made up to 304 lb. in all cases. Shipments for March were 561,000 qrs. from Argentina, and 669,000 qrs. from Russia.

Maize.—A halfpenny per lb., twenty shillings per quarter, continues to be spoken of as "bedrock value" for flat mixed maize, and the buyer more usually pays a guinea per quarter for quantities under, say, 1,000 qrs. The cheapness of round corn, which could on the 31st be bought for a guinea per quarter, is a feature of the day, for it is the sort preferred by a great number of buyers, and often commands 3*s.* to 4*s.* above the flat and yellow kinds. The last-named comes chiefly from Argentina, and pending new crop supplies therefrom are held very firmly; 23*s.* 6*d.* was paid on the 31st. Shipments were 1,143,000 qrs. from North America, 31,000 qrs. from South America, 387,000 qrs. from Russia, and 205,000 qrs. from Europe S.E.; there were also small consignments from South and East Africa, from Burma and from India.

Oilseeds.—The good crop of Indian linseed has relieved the oilseed market at a critical moment, and the markets from the 20th to the 31st were extremely busy purchasing new crop for prompt and May shipment; 70*s.* per qr. (410 lb.) was paid where the shipper could guarantee a vessel to leave port by the 31st, while 66*s.* was accepted on contract to clear by April 30th, 65*s.* by May 31st, and 64*s.* by June 30th. Remoter futures were at 64*s.* to 65*s.* per quarter. Argentina during March obtained 70*s.* to 72*s.* per 416 lb. for linseed arrived at British ports on sale, but owing to the pressure of Indian competition came down for April and May shipment to 65*s.* No special features have marked the trade in other oilseeds. The March shipments of linseed were 336,000 qrs. from South America, and 196,000 qrs. from India.

Various.—Beet-sugar was an encouraging and progressive market, and the price at Lady Day was 12½ to 15 per cent. better than at Christmas. The production in Germany, Austria, Hungary, and Russia was then said to be "a record" for all four of the great producing regions, but, however that may have been, cheap sugar appears to create an exceptionally vigorous retail demand, and those who bought between the close of November and the middle of January have done extremely well. Feeding rice has been a firm market, and stocks are moderate. A good trade in Dari is reported, and Burma is coming forward with welcome offers of prompt shipment at five guineas per ton. Farm seeds in March are always a busy market; this season a

good choice of red cloverseed is in contrast with extreme scarcity of lucerne and timothy. Both cocksfoot and sainfoin have been rather dear, and high prices have been made for the best white cloverseed.

THE LIVE AND DEAD MEAT TRADE IN MARCH.

A. T. MATTHEWS.

Fat Cattle.—The trade in fat cattle was very similar in most respects to that of February, values being very steady, but such changes as took place in the weekly averages showed a hardening tendency. With the Shorthorns, Scots, and Welsh the improvement was more marked for second than for first quality. The following are the averages of the various breeds:—Shorthorns, 8*s*. 0¼*d*., 7*s*. 4½*d*., and 6*s*. 4*d*. for March, against 8*s*., 7*s*. 3¼*d*., and 6*s*. 4*d*. in February; Herefords, 8*s*. 3½*d*. and 7*s*. 8*d*., against 8*s*. 0¾*d*. and 7*s*. 6¼*d*.; Devons, 8*s*. 1¾*d*. and 7*s*. 4*d*., against 8*s*. 0¾*d*. and 7*s*. 4½*d*.; Welsh Runts, 7*s*. 11¼*d*. and 7*s*. 5*d*., against 7*s*. 11¼*d*. and 7*s*. 3*d*.; Polled Scots, 8*s*. 1½*d*. and 7*s*. 9½*d*., against 8*s*. 1*d*. and 7*s*. 7½*d*., per 14 lb. stone. The supplies at most markets have been described as well up to the average for quality and those at the Metropolitan market have continued excellent, although they have chiefly consisted of Shorthorns coming from the eastern counties. The consequence has been that London quotations have stood at fully 2*d*. per stone above the English average all the month, only two or three being higher. One of the most striking features has, perhaps, been the continued low level in the great Lancashire markets, where Shorthorns only fetched about 7*s*. 10*d*. per stone, or 2*d*. below the general average, and 4*d*. below the London quotations. This was a distinct contrast with the relative values of sheep and mutton in those markets. Ipswich, where summer prices are usually much higher than those of London or any other market, has lately barely equalled the general average of the country. The Scotch markets have been firm, especially towards the end of the month, and Black Polls have frequently realised 40*s*. per live cwt.

Veal Calves.—Good veal calves have been scarce for the time of year, and the average prices were rather higher than in February. These were 9¼*d*. and 8¼*d*. for first and second quality. At Leicester in the third week they were quoted up to 1*s*. per lb., and 10*d*. was realised in seven other markets.

Fat Sheep.—The general averages for fat sheep have remained steady, but the tendency, like that with cattle, has been upwards. In about twenty English markets Downs of prime quality and small size established an advance of ¼*d*. per lb. on the February averages, other qualities remaining unchanged. The same thing happened with Longwools. The averages were:—Downs, 8¾*d*., 7¾*d*., and 6*d*. per lb., and Longwools, 8½*d*., 7¼*d*., and 5¾*d*. Large numbers of very fine Oxford and Norfolk tegs weighing 9 to 10 stone (8 lb.) have been sold at Islington at 8*d*. and 8¼*d*. per lb., and this class of sheep has formed the bulk of the London supplies. First quality tegs have been repeatedly quoted at 9*d*. per lb. in London, but there were comparatively few small enough to command that price. A few pens of choice Southdown hoggets have been sold at 9¼*d*., and even 9¾*d*. per lb., and it is probable that the Downs quoted at Bristol and Salford

at the latter figure were of that choicest of our English breeds. There have been great variations in value at certain markets, ranging from 8*d*. to 9½*d*. for both Downs and Longwools in the same week. Very high prices for the latter have ruled at Salford and Liverpool, but these are often exceptionally dear markets for mutton at this time of year. Moreover, the Longwools there quoted at 9½*d*. per lb. were of far superior quality and of more handy size than those sold at Leicester and Lincoln, &c., at 8*d*. The former are understood to be Irish hoggets, which seem popular with Lancashire butchers. At Liverpool, Preston, and Salford Cheviots have realised as much as 10*d*. per lb. Shorn sheep have been offered in considerable numbers, but have not realised more than about 7*d*. per lb.

Fat Lambs.—Lambs came to market in weekly increasing numbers as the month advanced, but often the weather has been too cold to ensure them a very large demand. In a few cases, in northern markets, 15*d*. per lb. has been given, but the general average for first and second quality was 13*d*. and 12*d*. per lb.

Fat Pigs.—The trade for bacon pigs improved to a small extent, and average prices varied scarcely to the extent of ¼*d*. per stone from week to week. The averages in Great Britain were 7*s*. 3½*d*. and 6*s*. 7½*d*. for first and second quality.

Carcass Beef—British.—The supplies of British beef have been ample for the demand in the London markets, and trade has been slow, but prices were about ¼*d*. per lb. higher than in February. Scotch whole sides averaged 6¼*d*. and 6*d*. and English 6*d*. and 5½*d*. per lb.

Port-Killed Beef.—Supplies were small, and prices almost exactly the same as for English.

Chilled Beef.—After the first week the arrivals from Argentina fell off to a very considerable extent, and prices rapidly advanced, till in the last week hindquarters had appreciated about 1½*d*. per lb. in value, and forequarters ½*d*. The averages for the month were about 4⅝*d*. and 4⅛*d*. for the former, and 3½*d*. and 3¼*d*. for the latter. What little United States chilled was on offer fetched 6*d*. to 6¼*d*. per lb.

Frozen Beef.—The value of frozen beef moved upwards in sympathy with that of chilled, and the average for hindquarters was 3⅞*d*., against 3½*d*. in February.

Carcass Mutton—Fresh-Killed.—There was a fair demand in London for Scotch teg mutton of very small size, at 8*d*. to 8¼*d*. per lb., but prime sheep of about 64 lb. only fetched 6½*d*. to 7*d*. English tegs of 72 lb. and upwards realised 6*d*. to 6½*d*., and these prices held throughout the month. English mutton sold much dearer in Lancashire.

Frozen Mutton.—New Zealand mutton was easier in value, and the average price for the best quality was 3⅞*d*. per lb., against 4⅛*d*. in February. There was an abundant supply of Argentine and Australian mutton of larger size sold under 3*d*. per lb.

Carcass Lamb.—The weather was too cold for the trade, and even the famous "Wallingford" sold at very poor prices, none quite making 1*s*. per lb. in London. The average price was 10⅝*d*. per lb. for the month for prime quality, and 10¼*d*. for second. The highest price for best Canterbury was 5½*d*. per lb.

Veal.—Prices for best veal were firm, but there was very little prime

English on offer. The top price was 8½*d.* per lb., but large quantities have been sold at half that price in London.

Pork.—The supplies in London were by no means large, and prime small porkers have fetched 7½*d.* per lb. all the month, and medium size have sold steadily at 6¾*d.* Dutch has fetched about ½*d.* per lb. less money.

THE PROVISION TRADE IN MARCH.

HEDLEY STEVENS.

Bacon.—All those dealing in imported bacon and hams have had again to face an unsatisfactory month's trading. Although prices during the month were on a much lower range than during March, 1910—in fact, in the case of hams they were 18*s.* to 20*s.* lower—the consumption in most districts has been considerably less, demonstrating that when an article of diet advances to abnormal prices and consumers are eventually forced on to a cheaper substitute, it takes a considerable time to get buyers back into the old groove.

The killings in Denmark have been heavier of late, and with the prices for Danish sides at about one penny per lb. under those of last year, this class of meat was in good demand. Arrivals from Russia and Siberia were free, and at the correspondingly low prices which are being taken for these goods, they are being much more widely distributed. At the end of the month Russian sides were selling at from 48*s.* to 54*s.* per cwt., but at these prices curers report that they are losing 4*s.* to 5*s.* per side. Under the supervision of English curers, and with English capital, supplies from this source are likely to increase largely during the present year, as additional factories are being erected in districts nearer to the hog supplies.

During the past month a great change took place in the American markets, the long anticipated fall in the prices for hogs being realised. with lower prices for the manufactured product. This naturally had the effect of bringing down prices in England, resulting in serious losses to importers on their contracted goods on spot and in transit. The greatest reaction was in lard. At the end of the month best brands of refined could be bought in pails at around 45*s.* per cwt., against 72*s.* at the same time last year. Merchants are making heavy losses on their present arrivals, in some cases over one penny per lb. However, it is thought by those best able to judge that we are now at the bottom of the market. The prices for hogs at Chicago during March, 1911, ranged from $6.10 to $7.25, against $9.65 to $11.15 last year, and $6.10 to $7.15 two years ago.

There has been a continued short supply of English pigs, but during the month prices went slightly against the breeders. Directly the consumptive demand improves, which should take place early in April, prices are bound to advance quickly.

Cheese.—A determined effort was being made throughout the month by those interested to lift prices, eventually resulting in the Canadian and New Zealand product being able to make about 3*s.* per cwt. more money than at the end of the previous month. The consumptive demand did not increase to any extent, and now we are getting near

the time when the new makes will be offered, the country operators are buying just as they require. There are also fair shipments on passage from New Zealand.

Advices from Canada report that some factories will commence making fodder cheese early in April, and they expect a large production this coming season, as the cows have wintered well, feed being abundant. Prices have fallen in the United States, and in order to ease their markets of surplus stock the Americans have accepted as low as 55*s.* 6*d.* c.i.f. for finest full-cream summer makes. These are small sizes, averaging about 40 lb. per cheese, as manufactured for their home trade. On their home markets prices are around 58*s.* to 67*s.* per cwt.

At the end of the month the estimated stocks of Canadian cheese at the three principal distributing centres (London, Liverpool, and Bristol) were 125,000 cheese, against 164,000 at the same time last year, and 137,000 two years ago. Also the stocks of New Zealand in London and Bristol were 33,000 crates, against 42,000 last year.

Butter.—A fair volume of trade passed during the month, but the business was not profitable. On account of the large arrivals from the Colonies, prices have remained low, about 15*s.* to 20*s.* below those current at the same time last year.

From January 1st to March 25th of this year, the increase in the arrivals from all countries amounted to about 7,000 tons in excess of last year, and large shipments are now on passage from Australia and New Zealand. On account of the low prices for best goods, fancy brands of Colonial were obtainable at 11½*d.* to 11¾*d.* per lb. The demand for secondary quality was very small, and stocks have accumulated in cold stores, and will make heavy losses to the owners. Some importers accepted as low as 9*d.* per lb. for lots showing a slight fishy flavour, rather than hold them.

A recent article in the *Montreal Trade Bulletin* reads:—"Our export butter trade with Great Britain is gradually slipping from us, the total exports for the season up to March 1st amounting to 27,884 packages, as compared with 44,057 packages for the same period last year. These figures appear very small when compared with the good old times of long ago, when our exports to Great Britain for about the same period totalled from 450,000 to 500,000 packages. At that time the United States competed with us in the English market, and later Australia and New Zealand made rapid headway, and are now steadily ousting us from the British market. Siberia and Argentina are also taking a hand in crowding out the Canadian product."

There has been a fall in prices in the United States of America, and stored creameries were offered for shipment at as low a price as 86*s.* c.i.f. These would be summer-made lots.

In Ireland the season is very promising, and a large output is anticipated.

Eggs.—There was an exceptional demand for fresh-laid English and Irish, on account of the smaller arrivals from the Continent. Rather than accept the present low prices for English, a good many dealers are placing their supplies in preservatives, anticipating a large demand during the time of the Coronation festivities.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of March, 1911.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	England. First Quality.	England. Second Quality.	Scotland. First Quality.	Scotland. Second Quality.
FAT STOCK:—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle:—	s. d.	s. d.	s. d.	s. d.
Polled Scots	8 2	7 10	39 4	36 4
Herefords	8 4	7 8	—	—
Shorthorns	8 1	7 5	38 4	35 9
Devons	8 2	7 5	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	9½	8¼	9	7½
Sheep:—				
Downs	8¾	7¾	—	—
Longwools	8½	7½	—	—
Cheviots	9¾	8¼	9¼	7¾
Blackfaced	9¾	8¼	7¾	6¾
Cross-breds	8¾	7¾	9	8
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs:—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	7 3	6 9	7 5	6 3
Porkers	7 10	7 2	7 10	6 10
LEAN STOCK:—	per head.	per head.	per head.	per head.
Milking Cows:—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	22 5	18 11	22 5	18 2
,, —Calvers	22 10	18 1	19 16	17 6
Other Breeds—In Milk ...	19 4	15 16	19 1	16 2
,, —Calvers ...	15 0	13 10	19 11	16 12
Calves for Rearing	2 7	1 15	2 18	2 1
Store Cattle:—				
Shorthorns—Yearlings ...	10 9	9 2	10 13	8 18
,, —Two-year-olds...	14 10	12 17	15 17	13 10
,, —Three-year-olds	17 10	15 11	17 6	15 6
Polled Scots—Two-year-olds	—	—	17 12	15 13
Herefords— ,,	16 1	14 10	—	—
Devons— ,,	14 13	12 16	—	—
Store Sheep:—				
Hoggs, Hoggets, Tegs, and Lambs—	s. d.	s. d.	s. d.	s. d.
Downs or Longwools ...	41 3	35 0	—	—
Scotch Cross-breds ...	—	—	34 1	30 1
Store Pigs:—				
Under 4 months	31 4	23 4	24 0	19 4

* Estimated carcass weight.
† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of March, 1911.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	Birmingham.		Liverpool.		London.		Manchester.		Edinburgh.		Glasgow.	
		per cwt.		per cwt.		per cwt.		per cwt.		per cwt.		per cwt.	
		s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
BEEF :—													
English	1st	53	6	53	6	55	0	52	6	54	6*	57	6*
	2nd	49	6	49	0	53	0	50	6	49	6*	53	0*
Cow and Bull ...	1st	47	0	45	6	46	6	48	0	46	6	47	0
	2nd	42	0	38	6	42	0	44	0	41	6	42	6
U.S.A. and Canadian :—													
Port Killed ...	1st	—		53	6	55	0	51	6	—		—	
	2nd	—		49	0	52	0	49	0	—		—	
Argentine Frozen—													
Hind Quarters...	1st	38	0	38	0	36	6	38	0	38	6	36	0
Fore ,, ...	1st	29	6	28	6	28	0	29	0	29	6	28	0
Argentine Chilled—													
Hind Quarters..	1st	43	6	45	0	43	6	45	0	44	0	44	0
Fore ,, ...	1st	31	0	30	6	31	6	31	0	31	6	31	0
Australian Frozen—													
Hind Quarters—	1st	37	0	—		36	6	34	0	—		34	6
Fore ,, ...	1st	29	0	—		28	0	26	6	—		28	0
VEAL :—													
British	1st	77	0	78	0	79	6	75	6	—		—	
	2nd	65	6	71	6	70	0	70	0	—		—	
Foreign	1st	—		69	0	77	6	67	6	78	6	—	
MUTTON :—													
Scotch	1st	—		78	6	75	0	79	0	66	0	70	6
	2nd	—		73	0	65	6	74	0	55	6	55	6
English	1st	65	6	72	0	61	0	73	0	—		—	
	2nd	55	0	66	6	56	6	66	0	—		—	
Argentine Frozen ...	1st	31	0	31	0	31	0	31	0	30	6	31	0
Australian ,, ...	1st	28	0	26	6	28	0	26	6	—		29	0
New Zealand ,, ...	1st	—		—		36	0	—		—		33	6
LAMB :—													
British	1st	—		—		101	0	—		—		—	
	2nd	99	0	—		95	0	—		—		—	
New Zealand ...	1st	51	6	50	0	50	6	50	0	53	0	56	6
Australian	1st	42	0	36	0	39	6	36	0	40	0	43	0
Argentine	1st	41	6	39	0	40	0	39	6	41	0	41	0
PORK :—													
British	1st	68	6	65	6	69	0	67	6	62	6	63	0
	2nd	61	0	60	6	63	0	63	0	53	6	60	6
Foreign	1st	—		—		64	6	—		—		—	

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1909, 1910 and 1911.

Weeks ended (*in* 1911).	Wheat.						Barley.						Oats.					
	1909.		1910.		1911.		1909.		1910.		1911.		1909.		1910.		1911.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
Jan. 7 ...	32	9	33	6	30	5	26	11	24	11	23	11	17	5	17	2	17	0
,, 14 ...	32	8	33	8	30	8	27	1	24	11	23	10	17	5	17	7	17	2
,, 21 ...	33	2	33	9	30	11	27	3	24	11	24	4	17	8	17	6	17	4
,, 28 ...	33	0	33	6	30	11	27	6	25	0	24	5	17	9	17	4	17	3
Feb. 4 ...	33	4	33	7	30	9	27	7	24	10	24	5	17	10	17	7	17	5
,, 11 ...	33	8	33	4	30	5	27	8	24	9	24	6	17	11	17	11	17	5
,, 18 ...	34	1	33	0	30	3	27	11	24	6	24	7	18	0	18	0	17	6
,, 25 ...	34	5	32	7	30	2	28	0	24	2	24	9	18	0	17	10	17	7
Mar. 4 ...	34	10	32	7	30	0	27	11	24	6	25	0	18	2	18	1	17	5
,, 11 ...	35	8	32	6	30	1	28	4	24	1	25	0	18	2	18	0	17	5
,, 18 ...	35	9	32	6	30	1	28	0	23	6	24	11	18	5	18	0	17	6
,, 25 ...	36	0	32	9	30	2	28	0	23	7	25	0	18	6	17	11	17	5
Apl. 1 ...	36	5	33	0	30	3	27	10	23	8	24	11	18	8	18	0	17	5
,, 8 ...	37	4	33	6	30	4	28	0	23	1	24	7	18	10	17	11	17	7
,, 15 ...	38	7	33	7			27	8	23	5			19	2	18	3		
,, 22 ...	41	4	33	7			28	2	23	0			19	9	18	3		
,, 29 ...	42	5	33	0			27	10	22	10			20	0	18	3		
May 6 ...	40	9	32	6			27	7	22	7			20	3	18	2		
,, 13 ...	41	6	32	1			27	3	22	0			20	6	18	1		
,, 20 ...	42	8	31	10			27	0	21	8			20	11	17	8		
,, 27 ...	42	6	31	3			26	3	21	4			21	0	17	10		
June 3 ...	43	1	30	2			25	7	21	8			21	3	17	10		
,, 10 ...	42	11	29	1			26	10	20	9			21	4	17	10		
,, 17 ...	42	7	29	0			26	10	18	11			21	6	18	0		
,, 24 ...	42	8	29	4			27	2	20	1			21	7	17	9		
July 1 ...	42	9	29	9			27	2	19	11			21	9	17	7		
,, 8 ...	43	0	30	4			26	4	19	5			21	8	17	4		
,, 15 ...	43	3	31	1			26	10	21	3			21	9	17	7		
,, 22 ...	44	0	31	11			27	4	19	9			22	5	17	5		
,, 29 ...	43	5	33	5			24	6	20	10			22	2	18	1		
Aug. 5 ...	44	9	33	9			27	4	20	5			22	11	18	3		
,, 12 ...	44	9	33	5			24	9	20	4			21	8	18	0		
,, 19 ...	41	6	32	11			23	11	20	11			19	8	17	11		
,, 26 ...	38	5	32	7			24	7	20	10			19	4	17	2		
Sept. 2 ...	37	2	32	2			26	3	22	10			19	6	17	2		
,, 9 ...	34	11	31	11			26	1	23	3			18	5	17	2		
,, 16 ...	33	6	30	11			26	5	24	3			17	9	16	6		
,, 23 ...	32	9	30	2			26	8	24	2			17	7	16	3		
,, 30 ...	32	2	30	1			26	9	24	4			17	2	16	4		
Oct. 7 ...	31	8	30	1			26	9	24	7			17	0	16	3		
,, 14 ...	31	4	30	2			27	0	25	1			17	0	16	2		
,, 21 ...	31	8	30	4			27	7	25	3			16	11	16	1		
,, 28 ...	31	10	30	4			27	9	25	4			17	0	16	2		
Nov. 4 ...	32	5	30	4			27	9	25	6			17	0	16	2		
,, 11 ...	32	5	29	11			27	7	25	4			17	1	15	11		
,, 18 ...	32	7	29	8			27	0	25	1			17	4	16	1		
,, 25 ...	33	0	29	11			26	8	24	10			17	3	16	4		
Dec. 2 ...	33	3	30	6			26	1	24	7			17	4	16	7		
,, 9 ...	33	3	30	9			25	7	24	3			17	3	16	9		
,, 16 ...	33	2	30	7			25	3	23	9			17	4	16	10		
,, 23 ...	33	1	30	7			25	2	23	10			17	4	16	9		
,, 30 ...	33	3	30	5			25	1	23	9			17	4	16	9		

NOTE.—Returns of purchases by weight or weighed measure are converted to Imperial Bushels at the following rates: Wheat, 60 lb.; Barley, 50 lb.; Oats, 30 lb. per Imperial Bushel.

AVERAGE PRICES of **Wheat, Barley,** and **Oats** per Imperial Quarter in FRANCE, BELGIUM, and GERMANY, and at PARIS, BERLIN, and BRESLAU.

—		Wheat. 1910.	Wheat. 1911.	Barley. 1910.	Barley. 1911.	Oats. 1910.	Oats. 1911.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France:	February	41 0	46 11	25 11	26 6	21 6	21 11
	March	41 11	46 5	25 11	26 8	21 10	21 11
Paris:	February	42 7	47 5	24 8	25 7	21 7	23 6
	March	43 1	47 0	24 8	24 8	21 6	22 8
Belgium:	January	36 0	32 9	23 8	23 8	19 2	19 2
	February	36 7	32 4	23 6	24 1	19 7	19 2
Germany:	January	44 8	41 2	26 5	27 10	21 2	21 5
	February	45 11	40 0	25 10	28 4	21 6	21 9
Berlin:	January	48 8	43 2	—	—	22 11	20 11
	February	48 9	42 7	—	—	23 1	21 4
Breslau:	January	45 10	38 3	26 2* 24 6†	27 2* 22 11†	20 4	19 8
	February	45 7	38 1	25 4* 24 2†	27 7* 22 11†	20 6	19 10

* Brewing. † Other.

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the German quotations are taken from the *Deutscher Reichsanzeiger*, the prices for the German Empire representing the average of the prices at a number of markets.

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of March, 1910 and 1911.

—	Wheat. 1910.	Wheat. 1911.	Barley. 1910.	Barley. 1911.	Oats. 1910.	Oats. 1911.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London...	33 8	31 7	22 10	24 4	19 1	18 6
Norwich	32 3	30 1	23 4	24 1	17 8	17 8
Peterborough	31 9	29 4	22 2	24 5	17 3	16 9
Lincoln...	31 11	29 6	23 2	25 5	17 11	17 9
Doncaster	31 9	28 10	24 7	26 0	18 0	17 4
Salisbury	32 10	29 4	24 0	23 5	17 9	16 10

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND in the Month of March, 1911.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Bristol.		Liverpool.		London.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British	14 9	13 6	—	—	14 6	12 6
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish Factory ...	—	—	96 0	88 0	98 0	94 0
Danish	—	—	121 6	119 0	121 0	119 0
French	—	—	—	—	126 0	120 0
Russian	102 6	97 0	102 6	99 0	107 0	103 0
Australian	104 6	100 0	103 0	99 0	105 0	102 0
New Zealand ...	108 0	104 6	109 0	105 0	107 0	104 0
Argentine	—	—	—	—	102 0	100 0
CHEESE :—						
British—						
Cheddar	76 0	65 0	74 0	70 0	79 0	73 0
			120 lb.	120 lb.	120 lb.	120 lb.
Cheshire	—	—	74 0	66 0	82 6	77 6
			per cwt.	per cwt.	per cwt.	per cwt.
Canadian	62 0	59 6	62 6	60 0	63 0	61 6
BACON :—						
Irish	69 6	65 6	68 0	64 0	72 0	69 0
Canadian	63 0	61 0	62 6	58 0	64 6	62 0
HAMS :—						
Cumberland	—	—	—	—	109 0	99 6
Irish	—	—	—	—	108 0	99 0
American (long cut)	59 6	56 0	58 0	54 0	73 0	64 6
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British	8 9	—	—	—	10 2	8 9
Irish	9 1	8 6	9 2	8 7	10 1	8 5
Danish	—	—	—	—	9 10	8 5
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Langworthy	98 0	89 0	83 6	75 0	101 0	91 0
Scottish Triumph ...	92 0	82 0	66 6	63 6	83 0	74 0
Up-to-Date	91 6	78 6	66 6	63 6	87 0	76 6
HAY :—						
Clover	90 0	75 0	95 0	70 0	100 0	83 6
Meadow	77 6	60 0	—	—	89 0	66 6

DISEASES OF ANIMALS ACTS, 1894 to 1910.

NUMBER OF OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

Disease.	March.		Three Months ended March.	
	1911.	1910.	1911.	1910.
Swine-Fever:—				
Outbreaks	240	*109	513	297
Swine Slaughtered as diseased or exposed to infection ...	2,661	831	5,731	2,210
Anthrax:—				
Outbreaks*	83	163	261	405
Animals attacked	98	205	299	498
Foot-and-Mouth Disease:—				
Outbreaks	1	—	1	—
Animals attacked	18	—	18	—
Glanders (including Farcy):—				
Outbreaks	15	39	52	93
Animals attacked	53	90	183	259
Sheep-Scab:—				
Outbreaks	45	48	275	283

* For 1910 the figures show the outbreaks reported, but for 1911 the outbreaks confirmed.

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

Disease.	March.		Three Months ended March.	
	1911.	1910.	1911.	1910.
Swine-Fever:—				
Outbreaks	12	5	35	11
Swine Slaughtered as diseased or exposed to infection ...	207	82	666	297
Anthrax:—				
Outbreaks	—	—	3	4
Animals attacked	—	2	3	6
Glanders (including Farcy):—				
Outbreaks	1	—	1	—
Animals attacked	1	—	1	—
Sheep-Scab:—				
Outbreaks	45	86	202	254

ADDITIONS TO THE LIBRARY.

[NOTE.—The receipt of *annual* publications of foreign agricultural and other departments, experiment stations and societies is not noted in the monthly list of additions to the Library. A list of these publications appeared in the *Journal* for October, November, and December, 1909.]

Agriculture, General and Miscellaneous—

Memoirs of the Geological Survey, England and Wales.—The Water Supply of Sussex from Underground Sources (Supplement). (255 pp. and map.) London: E. Stanford, 1911. 2*s.* 6*d.* [B. 36; M. 10.]

The Royal Commission on the Ancient and Historical Monuments and Constructions of Scotland.—Second Report:—Monuments and Constructions in the County of Sutherland. [Cd. 5507.] (xiii pp.) 1*d.* Second Report and Inventory of Monuments and Constructions in the County of Sutherland. (xlvi+195 pp. and maps.) 6*s.* London: Wyman and Sons, 1911. [A. 12.]

Laur, E.—Grundlagen und Methoden der Bewertung Buchhaltung und Kalkulation in der Landwirtschaft. (524+338 pp.) Berlin: Paul Parey, 1911. [B. 50; N. 2–3.]

Egypt, Ministry of Education.—Text-Book of Egyptian Agriculture. Edited by *G. P. Foaden* and *F. Fletcher.* Vol. II. (321–878 pp. and plates.) Cairo: National Printing Department, 1910. 9*s.* [A. 64.]

U.S. Dept. of Agriculture, Office of Experiment Stations.—Circ. No. 106:—The American System of Agricultural Education. (28 pp.) [B. 44–17.] Bull. No. 233:—Organisation Lists of the Agricultural Colleges and Experiment Stations in the United States. (100 pp.) [B. 44–17.] Washington, 1911.

U.S. Dept. of Agriculture.—Farmers' Bull. No. 428:—Testing Farm Seeds in the Home and in the Rural School. (47 pp.) [B. 18–1.] Washington, 1911.

Live Stock—

Pennsylvania State College Agricultural Experiment Station.—Bull. No. 104:—The Respiration Calorimeter at the Institute of Animal Nutrition of the College. (16 pp.) [F. 62–3.] Bull. No. 105:—Influence of Type and of Age upon the Utilisation of Feed by Cattle. (22 pp.) [F. 68–1.] Centre County, Pennsylvania, 1910.

County of Northumberland, Education Committee.—Bull. No. 15:—Feeding Experiments with Cattle and Sheep at the County Agricultural Experiment Station, Cockle Park, 1907–10. (33 pp.) Newcastle-upon-Tyne, 1910. [F. 68–1; F. 76–1.]

United Provinces of Agra and Oudh, Dept. of Land Records and Agriculture.—Bull. No. 25:—Notes on the Improvement of Cattle in the United Provinces. (3 pp.) Allahabad, 1910. 6 pies. [F. 30.]

New York Agricultural Experiment Station.—Technical Bull. No. 15:—The Acidity of Glüten Feeds (65–79 pp.) Geneva, New York, 1910. [F. 74–1.]

New Jersey Agricultural Experiment Stations.—Bull. No. 230:—Concentrated Feeding Stuffs. (50 pp.) New Brunswick, New Jersey, 1910. [F. 74–1.]

Texas Agricultural Experiment Stations.—Bull. No. 131:—Hog Feeding Experiments. (33 pp.) Brazos County, Texas, 1910. [F. 82–1.]

Leffingwell, A.—American Meat and its Influence upon the Public Health. (208 pp.) London: G. Bell and Sons, 1910. 3*s.* 6*d.* net. [F. 70; F. 82–3.]

Italy, Ministero di Agricoltura, Industria e Commercia.—Censimento Generale del Bestiame del 19 Marzo 1908. (692 pp. and charts.) Rome, 1910. [F. 28.]

U.S. Dept. of Agriculture, Bureau of Animal Industry.—Bull. No. 129:—Cattle Breeders' Associations in Denmark. (40 pp.) [F. 26; N. 4–11.] Bull. No. 131:—Beef Production in Alabama. I.—Cost of Raising the Cattle. II.—Wintering Steers Preparatory to Summer Fattening on Pasture. III.—Fattening Cattle on Pasture. (47 pp.) [F. 46; F. 68–1.] Washington, 1911.

New South Wales, Dept. of Agriculture.—Farmers' Bull. No. 38:—Cattle Dogs and Sheep Dogs. (15 pp.) Sydney, 1910. [F. 88.]

Blew, W. C. A., and others.—Light Horses, Breeds and Management. [Live Stock Handbook, No. 2.] London: Vinton and Co., 1907. 3*s.* 6*d.* net. [F. 64–1.]

Aberystwyth, University College of Wales, Agricultural Department.—Bull. No. 1:—Report on Experiments with Live Stock, conducted during the years 1908–9–10. Aberystwyth, 1911. [F. 62–1.]

Dairying and Food, General—

Queensland, Dept. of Agriculture and Stock.—The Dairy Produce Acts, Notes and Regulations. (37 pp. and plan.) Brisbane, 1909. [G. 28.]

New York Agricultural Experiment Station.—Technical Bull. No. 14:—The Fermentation of Citric Acid in Milk. (41–48 pp.) Geneva, New York, 1910. [G. 54–3.]

Edinburgh and East of Scotland College of Agriculture.—Report XXII:—The Variation in the Composition of Milk, Fifth Annual Report on the Work at Rosslynlee, 1909–10. (42 pp.) Edinburgh, 1911. [G. 56–7.]

University of California Agricultural Experiment Station.—Bull. No. 209:—The Cream Supply. (113–137 pp.) Berkeley, California, 1911. [G. 56–1.]

Transvaal Dept. of Agriculture.—Science Bull. No. 9:—How much Butter Fat does Cream Contain. (23 pp.) Pretoria, 1910. [G. 56–3.]

Wing, H. H.—Milk and its Products: a Treatise upon the Nature and Qualities of Dairy Milk and the Manufacture of Butter and Cheese. (311 pp.) New York: The Macmillan Co., 1909. 4*s.* [G. 56–1; G. 60–1; G. 66–1.]

Snyder, H.—Dairy Chemistry. (190 pp.) New York: The Macmillan Co., 1907. [G. 54–1.]

Hunziker, O. F., and *Spitzer, G.*—A Study of the Chemical Composition of Butter Fat, and its Relation to the Composition of Butter. (15 pp.) Lafayette, Indiana, 1909. [G. 60–3.]

Purdue University Agricultural Experiment Station.—Bull. No. 143 (Popular edition):—*Standards for Evaporated Milk, Sweetened Condensed* Milk and Condensed Skim-Milk.—Federal and State Dairy Laws. (15 pp.) [G. 22.] Bull. No. 145:—Testing Cream for Butter Fat. (531–595 pp.) [G. 56–5.] Lafayette, Indiana, 1910.

Ligue contre la Mortalité Infantile.—Le Bon Lait. Rapports Présentés à la Commission instituée par la Ligue pour l'étude de la production du bon lait. (198 pp.) Paris: Masson et Cie., 1910. [G. 56–1.]

Veterinary Science—

Queensland, Dept. of Agriculture and Stock.—Plan and Specification of Cattle Dip. (10 pp. and plan.) Brisbane, 1909. [H. 36–1; M. 2.]

Maryland Agricultural Experiment Station.—Bull. No. 145:—Tuberculosis of Animals. (267–314 pp.) College Park, Maryland, 1910. [H. 54–1.]

U.S. Dept. of Agriculture, Bureau of Animal Industry.—*Circ. No. 165*:—Methods for the Eradication of Gid. (29 pp.) Washington, 1910. [H. 42–1.]

Baldassarre, S.—Elementi di Anatomia e di Fisiologia del Bestiame Rurale. [La Scienza e la Pratica dell' Agricoltura, Vol. VII.] (843 pp.) Naples: Eugenio Marghieri, 1902. [H. 28–1.]

Kentucky Agricultural Experiment Station.—Bull. No. 143 :—Sheep Scab. (217–246 pp.) Lexington, Kentucky, 1909. [H. 42–3.]

Hayes, Capt. M. H.—Veterinary Notes for Horse Owners; a Manual of Horse Medicine and Surgery written in popular language. [Seventh edition.] (846 pp.) London: Hurst and Blackett, 1906. 15*s.* net. [H. 34–1.]

Röder, O. (edit.).—Haubner's Landwirtschaftliche Tierheilkunde. [15 Auflage.] (782 pp.) Berlin: Paul Parey, 1911. 12 M. [H. 28–1.]

Holland, Departement van Landbouw.—De Tuberculose onder het Rundvee en Hare Bestrijding. (35 pp.) The Hague, 1911. [H. 54–1.]

Birds, Poultry and Bees—

Maryland Agricultural Experiment Station.—Bull. No. 146 :—Poultry House Construction and its Influence on Domestic Fowls. Part I. (31 pp.) College Park, Maryland, 1910. [K. 12–13.]

U.S. Dept. of Agriculture, Bureau of Chemistry.—Circ. No. 64 :—Studies of Poultry from the Farm to the Consumer. (42 pp.) Washington, 1910. [K. 12–3.]

Lewis, H. R.—Poultry Laboratory Guide, a Manual for the Study of Practical Poultry Keeping. (120 pp.) New York: The Macmillan Co., 1910. 3*s.* net. [K. 12–1.]

South Australia, Dept of Intelligence.—Special Bulletin :—Protected Native Birds of South Australia. (30 pp. and plates.) Adelaide, 1910. [K. 8–5.]

U.S. Dept. of Agriculture, Biological Survey.—Bull. No. 36 :—Raising Deer and other Large Game Animals in the United States. (62 pp.) Washington, 1910. [K. 2; K. 18–13.]

University of Minnesota Agricultural Experiment Station.—Bull. No. 119 :—Poultry at the Northwest Experiment Farm. (143–175 pp.) Saint Paul, Minnesota, 1910. [K. 12–3.]

American Museum of Natural History.—Bulletin, Vol. XXVII., 1910 :—The Orders of Mammals. (524 pp.) New York, 1910. [K. 2.]

Geary, H.—Profitable Bee Keeping. [The "Small Holder" Library, No. 1.] (124 pp.) London: C. Arthur Pearson, 1911. 1*s.* net. [K. 16–1.]

Cowan, T. W.—The British Bee-Keeper's Guide Book. [Nineteenth edition.] (226 pp.) London: Madgwick, Houlston and Co., 1907. 1*s.* 6*d.* [K. 16–1.]

Barkley, H. C.—Studies in the Art of Rat-catching. (185 pp.) London: J. Murray, 1911. Popular edition. 1*s.* net. [K. 22.]

Forestry—

Forbes, A. C.—The Development of British Forestry. (274 pp.) London: E. Arnold, 1910. 10*s.* 6*d.* net. [L. 2–1.]

Pool, R. J.—Summer Botany for Forestry Students in the Mountains of Colorado. [Reprinted from the Forest Club Annual, The University of Nebraska, Vol. I., 1909.] (21–34 pp. and plates.) Lincoln, Nebraska, 1909. [L. 12.]

Phillips, F. J.—Hail Injury on Forest Trees. [Trans. of the Academy of Science of St. Louis, Vol. xix., No. 3.] (49–56 pp. and plates.) St. Louis, 1910. [L. 20–9; M. 28.]

University of Nebraska Agricultural Experiment Station, Dept. of Forestry.—Circ. No. 1 :—Co-operative Experiments in Forest Planting. (8 pp.) Lincoln, Nebraska, 1909. [L. 20–3.]

Canada, Dept. of Interior, Forestry Branch.—Bull. No. 9 :—Forest Fires in Canada. (40 pp.) Ottawa, 1910. [L. 14; L. 20–9.]

U.S. Dept. of Agriculture, Forest Service.—Circ. No. 179 :—Utilisation of California Eucalypts. (30 pp.) [L. 20–15.] Washington, 1910.

University of Missouri, Agricultural Experiment Station.—Bull. No. 89 :—Forest Conditions in the Ozark Region of Missouri. (193–280 pp. and map.) Columbia, Missouri, 1910. [L. 12.]

Buhler, Anton.—Untersuchungen über die Bildung von Waldhumus. [2 Heft der Mitt. der Württemb. Forstlichen Versuchsanstalt.] (70 pp.) Stuttgart: Eugen Ulmer, 1910. [L. 20–3.]

South Australia, Intelligence Department.—Special Bulletin No. 15:—The Manufacture of Charcoal. (15 pp.) Adelaide, 1910. [L. 30.]

Schlich, Sir W.—Manual of Forestry. Vol. III.:—Forest Management. [Fourth edition.] (403 pp.) London: Bradbury, Agnew and Co., 1911. 9*s.* net. [L. 20–1.]

Endres, M.—Lehrbuch der Waldwertrechnung und Forststatik. [Zweite Auflage.] (308 pp.) Berlin: Julius Springer, 1911. 9 M. [L. 20–1; L. 37.]

Königlich Preussisches Ministerium für Landwirtschaft, Domänen und Forsten.—Amtliche Mitteilungen aus der Abteilung für Forsten, 1909. (47 pp.) Berlin: Julius Springer, 1911. [L. 4.]

Engineering—

Arkansas Agricultural Experiment Station.—Bull. No. 104:—Farm Drainage. (285–314 pp.) Fayetteville, Arkansas, 1909. [M. 12.]

New South Wales, Dept. of Agriculture.—Farmers' Bull. No. 33:—Irrigation with Artesian Water. (38 pp.) Sydney, 1910. [M. 8.]

Usill, G. W.—Practical Surveying. [Ninth edition.] (358 pp.) London: Crosby Lockwood, 1908. 7*s.* 6*d.* [M. 22.]

Horner, D. W.—Weather Instruments and How to Use Them. (48 pp.) London: Witherby and Co, 1910. 6*d.* net. [M. 28.]

Economics—

Ertl, Dr. Moriz, and Hennet, Dr. Leopold Frh. von.—Die landwirtschaftlichen Berufsgenossenschaften (*Syndicats agricoles*) in Frankreich. (421 pp.) Vienna, 1910. [N. 4–7.]

Hennet, le Baron de.—Rapport sur l'Organisation Syndicale et Coopérative de l'Agriculture autrichienne. (17 pp.) Rouen, 1910. [N. 4–7.]

Mills, J. Saxon.—England's Foundation: Agriculture and the State. (93 pp.) London: P. S. King and Son, 1911. 1*s.* net. [N. 2–3.]

Davenport, C. B.—Statistical Methods, with Special Reference to Biological Variation. (223 pp.) New York: J. Wiley and Sons, 1904. [N. 44–1.]

France, Ministère de l'Agriculture.—Le Crédit Agricole. But.—Commentaire de la Législation. Résultats Obtenus. (88 pp.) Crédit à Long Terme en faveur de la Petite Propriété Rurale. (57 pp.) Guide Pratique pour la Tenue de la Comptabilité d'une Caisse Locale de Crédit Agricole Mutuel. (55 pp.) Paris, 1910. [N. 6–5.]

Board of Trade.—Translation of the New Swedish Customs Tariff Law, to come into force from 1st December, 1911. [Cd. 5464.] (86 pp.) London: Wyman and Sons, 1911. 9½*d.* [N. 80.]

Royal Commission on the Land Transfer Acts.—Second and Final Report of the Commissioners. [Cd. 5483.] (56 pp.) London: Wyman and Sons, 1911. 6*d.* [N. 10–1.]

Turnor, Christopher.—Land Problems and National Welfare. (343 pp.) London: J. Lane, n.d. [N. 2–3.]

Bowley, A. L.—Elements of Statistics. Third edition. (336 pp.) London: P. S. King and Son, 1907. [N. 44–1.]

Board of Trade.—Census of Production (1907), Preliminary Tables, Part VII. [Cd. 5545.] London: Wyman and Sons, 1911. 5½*d.* [N. 40.]

Central Land Association.—Finance (1909–10) Act, 1910. Section 69. Further Relief from Income Tax under Schedule A. (4 pp.) [N. 24–9.] Rating of Woodland. (6 pp.) [N. 24–11.] 1911.

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MOLASSES AND SUGAR FOODS FOR LIVE STOCK.

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MOLASSES, or treacle, which is well known as an article of human diet, has also served as a food for horses and cattle, particularly during the past twenty-five years. This has been largely due to the development of the beet sugar industry in Europe, for molasses is the uncrystallisable residue left in the manufacture of sugar, either from the juice of the sugar cane or the sugar beet. Previous to the above-mentioned period, molasses had been used in various parts of England, particularly in Norfolk, as a food for fattening cattle, but the frequent rises in price prevented more than small quantities being employed. When the price of molasses was low, then it was used to a considerable extent in certain districts, for it was recognised that where much straw had to be fed, a sprinkling of molasses, thinned down with water, made the chopped straw palatable to stock.

Unpurified molasses, whether from sugar cane or sugar beet, is a thick; brown syrup with a peculiar, sharp smell. When it is bleached it gives the well-known golden syrup, which is largely used for human food and in the manufacture of confectionery of various sorts. The improved methods which are now in vogue in the sugar factories, both in the boiling down of the juice and in the separation of the crystals of sugar, have resulted in the molasses being of poorer quality than formerly. In the older processes of sugar making, before vacuum pans were employed and when the sugar was left to

crystallise and the molasses simply drained off, a product was left which contained as much as 60 per cent. of saccharose,* along with some 10 per cent, or more of glucose. The use of centrifugal machines in the separation of the sugar crystals and the employment of chemical methods fôr extracting as much sugar as possible from the molasses have, however, made a considerable difference in the actual sugar content of the latter.

At the present time a medium grade cane molasses contains from 30 to 35 per cent. of saccharose, and from 25 to 30 per cent. of glucose and other sugars. The detailed analysis of a low grade cane molasses, such as is used for cattle feeding, is given as:—

Cane sugar	27·50	per cent.
Invert sugar, dextrose, and levulose	23·50	,,
Other carbohydrates and nitrogenous albuminoids	14·25	,,
Ash or mineral matter	9·25	,,
Water	25·50	,,

Average medium or low grade cane molasses contains from 50 to 60 per cent. of various sugars, along with some 10 per cent. of crude protein.

Beet sugar molasses is almost identical, both in appearance and physical properties, with cane molasses. The colour is perhaps a little darker, and the smell less pleasant. Beet molasses, like cane molasses, contains less sugar than formerly, owing to improved methods of concentrating the juice and separating the crystals of sugar. These improvements were, in fact, first introduced into beet sugar factories, and they were so successful that they were adopted by the manufacturers of sugar from sugar cane. An average analysis of beet molasses may be taken to be as follows:—

Nitrogen-free extract substances (carbohydrates)	60·5	per cent.
Crude protein	10·3	,,
Ash...	7·2	,,
Water	21·5	,,

As regards the nitrogen-free extract substances or carbohydrates, the amount of these present in beet molasses is practically identical with that found in cane molasses, so

* Saccharose, cane sugar or sucrose. All these terms apply to the one sugar which is seen in almost pure form in ordinary lump sugar. This sugar, which is typical carbohydrate, differs from glucose in crystallising more readily. Glucose found in molasses largely because of the "inversion" of the cane sugar during the

that the feeding value of the two as regards carbohydrates (mainly sugars in each case) is the same. The composition of molasses may vary somewhat from the above figures, but that is due more particularly to the percentage of water present. Calculated upon the dry matter, the quality of molasses, even of widely differing origin, is remarkably constant as regards the sugar which it contains.

Previous to September 1st, 1903, all molasses imported into this country had to pay a duty of 1*s*. per cwt., but since that date exemption has been granted in the case of molasses intended to be used solely as a food for stock or in the manufacture of cattle foods. This privilege has enabled the West Indian sugar planters to dispose of their molasses to better advantage than previously, since cane sugar molasses is generally preferred by the feeder.

Enormous quantities of molasses are produced annually in the large Continental factories which make sugar from sugar beets, and most of the reliable investigations on the use of molasses as a food for stock were, in fact, made with beet molasses. The agreement in the composition of cane and beet molasses, which has already been pointed out, enables the results of these investigations to be applied equally well to cane molasses. There are one or two minor differences between beet and cane molasses, to which attention will be called later on.

The nitrogen-free extract substances, or carbohydrates, which are present in molasses are mainly sugars, of which cane sugar (saccharose) is the chief representative. Invert sugar—dextrose and levulose—raffinose, as well as varying quantities of organic substances, gums, mucilage, &c., which are not really sugars, are also found in molasses.

The feeding value of cane sugar was tested as long ago as 1855 by Lawes and Gilbert, who came to the conclusion that it was equivalent to that of starch. Since that time a great deal of experimental work has been done with sugar, either in the pure form or in molasses, and the results on the whole agree with those obtained by Lawes and Gilbert. The very careful investigations of Kellner have, however, led him to place a less value upon sugar than upon starch for the production of body fat. The reason of this may almost un-

doubtedly be ascribed to the activity of micro-organisms in the intestinal tract, which bring about greater losses from fermentation in the case of sugar than they do in the case of starch. The other sugars—dextrose, levulose, raffinose—present in molasses, as well as the nitrogen-free extract substances which are not sugars, have not been carefully studied, but it may safely be assumed that the former group has a feeding value closely allied to that of cane sugar.

The nitrogenous substances found in molasses are not true protein or albuminoids like those present in such a feeding stuff as linseed cake. They are of an amide nature, and substances of this class have not the food value of the real proteins. Opinions differ as to the value which should be given to amides, and in some respects modern views are not in accordance with what was previously thought to be the true state of affairs. Recent investigations have gone to show that in the case of ruminants it is possible for these amide substances to be built up into true proteins in passing through the walls of the intestine, so that they may, under certain circumstances, act like the true proteins found in feeding stuffs. Where the animal is well nourished it is safe to say that these amide nitrogenous substances have a feeding value which is not superior to the carbohydrates, for they do not then play the part of true proteins in building up tissue, but simply yield up the energy which they contain, and this can go to the heating of the body, the performance of work, or the formation of body fat.

It is necessary that this point should be understood by the buyer, for it is not right that he should be led to think that molasses contains the same class of nitrogenous substances as does a concentrated feeding stuff, the money and feeding values of which are considerable. On this account the practice adopted in some analytical reports of multiplying the nitrogen found in molasses or molasses feeds by the usual factor for converting it into true protein or albuminoids, and then allowing this figure to appear as though it really expressed a certain amount of protein, is to be strongly deprecated.

Another point which ought also to be noticed in this connection is the fact that these amide substances—aspartic acid,

glutamic acic, leucine, and, above all, betäine—have an irritant effect upon the digestive and excretory apparatus, and tend to cause scouring and an increased secretion of urine. This laxative effect is very noticeable, in fact, with some kinds of molasses, and may be traced to various causes. The sugar itself is probably the main cause, for it is well known that it has this effect; and added to this is the irritation due to the amides, as well as that due to the salts, particularly in the case of beet molasses. These salts, which are of an alkaline nature, and are principally potash salts of organic acids, are recognised as having an irritating action upon the kidneys, which causes more urine to be secreted, and so the animal "stales" more frequently than it otherwise would. With cane sugar molasses the irritant effect is less noticeable, although the sugar still exercises a laxative action.

There is no fat in molasses, or, at most, only a trace, so that the actual food nutrients in molasses itself are the nitrogen-free extract substances, principally sugars, and some 10 per cent. of amides, the feeding value of which is questionable, and probably ought not to be reckoned superior to the nitrogen-free extract substances themselves.

The percentage of water in molasses is of importance, for frequently the amount exceeds that given in the analyses already quoted, and if so, not only is the buyer likely to be defrauded, but the molasses is then very liable to ferment and become worthless as a food. Molasses is often, in fact, made more fluid, and so easier to handle, by blowing steam into it, which may be done to such an extent that the percentage of water may be raised to 30 per cent. or more.

As regards the feeding of molasses there is ample proof that in moderate quantities it is a useful and economical food for all classes of stock. By gradually accustoming the animals to its use, it is possible to feed large amounts at a time without causing scouring, although the laxative effect is certain to be noticed. It is stated that fattening cattle may be fed as much as 8 lb. per day per 1,000 lb. live weight, but it is questionable if these large quantities are economical, in view of th[illegible] when an excessive amount of carbohydrate mate[illegible] of the other constituents of the [illegible]

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Dairy cows have been fed 3 lb. and more daily per 1,000 lb. live weight without ill effect, although in some feeding experiments with molasses it has been found that the milk increased in quantity at the expense of quality. The butter from cows receiving molasses is not influenced detrimentally.

For horses, a moderate use of molasses has been recommended, not only on account of its feeding value, but also because in stables where it was used the attacks of colic were much less frequent. Large horse-owners have been known, however, to object to molasses because of its effect in causing the animal to urinate excessively. Molasses in some form or other has also been fed to sheep and pigs, with, on the whole, satisfactory results. The conclusions, in fact, to be drawn from the use of feeding treacle are that in moderate quantities it is a good food, and may be particularly useful where it is necessary to feed much straw or inferior hay. A pound or so of treacle diluted with warm water and poured over chopped straw or hay will induce the animal to clean up its ration very completely. The flesh of animals fed excessively upon molasses is not of the best quality, and animals soon lose condition again, although they may fatten rapidly.

When beet molasses came into general use it was held to be a dangerous food for young or pregnant animals, particularly the latter, as it tended to cause them to abort. In the same way molasses was decried as an article of diet for male breeding animals, as it was thought to cause sterility, particularly in the case of bulls. Probably there was foundation for these beliefs, for it has been observed in other connections that when male animals are receiving considerable quantities of sugar the reproductive functions are diminished.

When molasses or feeding treacle is used, the best way to give it to stock is to mix the quantity required with warm water and pour it over the dry food, and then stir the whole well. It is found, however, and this cannot be denied, that treacle is not a nice material to handle, for it flows slowly from a cask, and its stickiness is a distinct drawback. Also, good quality treacle is often pilfered by the attendants, although this can easily be prevented by mixing with it a little coal-dust. The objections to which reference has just been made have resulted in some absorbent substance

being used to soak up the molasses, and by employing suitable materials it is possible to prepare molasses feeds which are practically dry, and so very convenient to handle. These molasses, or sugar feeds, have increased enormously during the past few years, and their composition and feeding value are widely different. Where the absorbent material or "base" is itself a food, the two together may make an article having a well-balanced feeding value. For example, palm nut meal from which the oil had been extracted has been used as an absorbent of molasses, and the resulting product was found to be most satisfactory, because the meal, being rich in protein (albuminoids) and also containing a little fat, balanced the purely carbohydrate nature of the molasses. One molasses food of this kind was found to have the following composition:—

Nitrogen-free extract substance	48·68	per cent.
Protein	14·78	,,
Fat	4·60	,,
Crude fibre	15·08	,,
Ash	6·37	,,
Water	10·49	,,

This analysis corresponds closely with that of coarse bran, and it must be noted that a good deal of the protein is true protein, and not amides, as it would be in molasses alone.

Cocoanut meal, dried brewers' grains, malt-coombs, and dried beet pulp or slices are also good absorbents of molasses, for although they may not absorb as much as some other materials to be mentioned later they are, nevertheless, foods in themselves. Chopped hay, clover, straw, &c., have also been used as bases in the preparation of molasses feeds, and here again their food value comes into account, in addition to that of the molasses. Dried spent hops is another absorbent which is used in a well-known molasses feed, and here the food value of the base is perhaps half that of dried brewers' grains.

Another class of sugar feeds is that in which the molasses is absorbed by bran, pollards, or other miller's offals, or some more starchy material like tapioca meal. These feeds also have a food value in addition to that of the molasses alone.

Lastly, there is a class of molasses feeds in which the absorbent material or base is of little or no food value. Perhaps the most characteristic example is furnished by a

mixture of peat moss and molasses. It was soon discovered that peat moss is a very good absorbent of molasses, and that twenty parts of this material could soak up eighty parts of molasses and give a product which could be called dry. Some varieties of peat are more suitable than others, and at the present time these peat molasses mixtures are sold in large quantities. Some are satisfactory from the point of view of preparation, whilst others are manifestly unsuitable for food, being coarse and sour, and often possessing an objectionable smell. The chemical analyses of these molasses feeds often fail to show their exact composition, for no distinction is made between the true protein (albuminoids) and the amides, nor is the percentage of actual sugar always given. It would be invidious to give the names of these proprietary peat-moss molasses feeds, but the accompanying table shows the analyses of several of the best known British and Continental makes.

	I.	II.	III.	IV.
Nitrogen-free extract substances...	55·81	52·48	52·60	(40·0)
Protein	8·75	8·25	8·34	7·44
Oil	1·20	0·73	0·87	0·28
Crude fibre..	4·81	6·63	5·85	—
Mineral matter	7·03	7·54	7·54	6·8
Water	22·40	24·37	24·85	25·2
Containing sugar	—	36·44	31·7	40·0

The percentage of sugar in these peat molasses foods is thus seen to vary between 31 and 40 per cent., and the protein stands at 8 per cent. on an average. As neither peat nor molasses contain more than a small amount of true protein (albuminoids) the value of the protein shown in the analyses is certainly not what it would be in oats, for example. The small amounts of fat in peat molasses should also be noted.

Instead of peat moss, various other absorbents, such as the pith of the sugar-cane (known as megass or bagasse), ground husks of earthnut, crude cellulose, &c., are used. The feeding value of peat moss or the other absorbents just mentioned has not been accurately determined in every case, but so far as peat is concerned Kellner and Pfeiffer have shown that not only is it valueless from the feeding point of view, but that it withdraws from the body a certain quantity of nutriment.

This is because the peat is only digested to a very slight extent, and the undigested portion takes with it what otherwise would go to nourish the body. In other words, peat moss has a negative food value.

The writer, whilst at the South Eastern Agricultural College, found, from direct digestibility trials with sheep, that the crude fibre in a food said to be composed of pure cellulose and cane sugar molasses was only digested to the extent of 10 to 12 per cent. In the case of a well known feed, in which megass is said to be the base, the digestibility coefficient of the crude fibre was about 40 per cent.

The buyer of any molasses feed ought to consider what is the feeding value of the absorbent material, and what is the money value compared with the molasses itself. It is unquestionably much nicer to handle some of these dry preparations instead of having to deal with the molasses itself, but often this convenience is paid for at a high rate, and a thrifty buyer would generally do far better if he bought molasses and mixed it himself with the dry portion of the ration as directed in the earlier part of this article.

It should further be noted that these molasses feeds often contain a high percentage of water (see table, page 104), and they are then very liable to ferment, particularly if the bags containing the feed are kept in a warm place close together. Once fermentation begins the sugar is attacked by micro-organisms of various kinds, and converted into acids, or otherwise so changed that its feeding value is greatly diminished.

The writer, during the past few years, has examined a large number of molasses feeds kept under various conditions, and in the case of some of them this tendency to ferment was very great, and quickly rendered the food unfit for use. Others remained unchanged for a long time if stored in a cool place with plenty of ventilation and on a board floor.

If it were recognised that a molasses food is a mixture of an absorbent and molasses, and that where the former has no feeding value the latter alone comes into consideration, much of the present advertising of those foods, which are really only valuable for the molasses (sugar) which they contain, would not yield much return to the advertisers.

The ears of a sensible buyer of molasses feeds should also be closed to the fanciful statements which are often made, particularly as regards peat molasses, as to the secondary actions of this mixture, *e.g.*, the improvement which it causes in the digestion of the food, the neutralisation of the alkaline salts of the molasses by the acids of the peat, the effect upon worms in the body, &c. They may or may not have some foundation in fact, but healthy animals have no need of such secondary actions, and from the feeding point of view they are not worth consideration. Feeding treacle can be bought at the present time for about 95*s*. per ton; it contains, as the analyses already quoted show, from 50 to 60 per cent. of sugars of various kinds, so it is possible to compare the prices and feeding values of molasses feeds with these figures.

Lastly, it may be mentioned that molasses is used to a considerable amount in the manufacture of compound cakes. It there serves to bind together the dry materials, and allows them to be pressed into a cake. At the same time it imparts a sweet taste to the whole, so that such cakes are generally very palatable to stock, and readily eaten by them. That it may also serve to disguise some unpalatable constituents of the cake must also not be forgotten.

LABOURERS' COTTAGES.

WILLIAM J. JOLLY.

IT will be readily admitted that many farms have not been adequately equipped with suitable and sanitary housing for the workers on the land, and during the last three or four decades the agricultural depression has not improved conditions in this respect. Consequently, it is no uncommon thing to find that the upkeep of cottages, farmhouses, and buildings has been much neglected, frequently to such an extent that they have either fallen into disuse or been allowed to get into a state beyond repair.

The difficulties connected with the labour question on large farms and the provision of suitable cottages seem to become more acute every year, though in order to ensure proper cultivation and management, and to maintain the rental value, it is necessary to provide sufficient cottages,

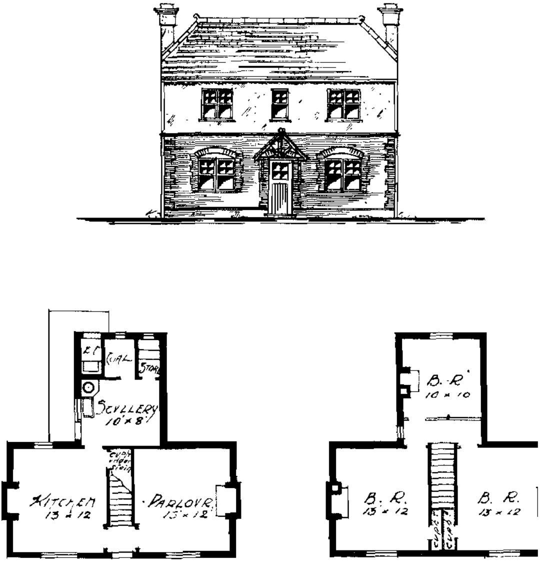


FIG. 1.—DESIGN FOR A SINGLE COTTAGE TO COST FROM £200 TO £225.

which, moreover, require to be of a higher class than formerly, owing to the general improvement in taste and rise in the standard of comfort which have resulted from the wider diffusion of education and sanitary science.

The main deterrent to the provision of such cottages is, perhaps, the increased expenditure in all building operations, chiefly owing to the advance in the price of labour. It is generally recognised that the return on the outlay in building cottages is so small as to be unremunerative if the rent that can be obtained is the only consideration. When the rates, taxes, and other outgoings (including the provision of a sinking fund where a loan has been obtained) have been set against the rents that can be expected from labourers, it is obvious that the return will be a small one, though the fact that the land has an enhanced value attached to it by the equipment of such cottages and the convenience afforded by having labour close at hand, must not be overlooked.

Cost.—The cost of erection varies in different parts of Great Britain, local circumstances being the chief governing factor. For instance, where stone, gravel, sand, &c., can be obtained on the site, it is possible to reduce the cost of building, as haulage is a serious item in many instances.

The accompanying illustrations show:—(Fig. 1) A single cottage to cost from £200–£225; (Fig. 2) a pair of cottages to cost from £300–£350; (Fig. 3) a block of three cottages to cost from £550–£600. These are applicable to any variety of site, and, in order to keep down the cost as much as possible, are simple in plan and unpretentious in design.

Experience of the erection of small houses and cottages in Hertfordshire and the Midlands within recent years shows that it is possible to build cottages of this type in a thoroughly substantial manner for between 4*d.* and 4½*d.* per cubic foot. It is very undesirable to have cottages erected which are likely to require a considerable amount of attention or outlay in repairs.

Accommodation.—Opinions differ on the question as to whether a parlour is necessary, but there are some tenants who would not live in a cottage were not this additional luxury provided, and in any case, if not needed as an additional sitting-room, it can be utilised as a bedroom, or the

room may be let to a lodger in order to augment the income of the family. Fig. 2, however, shows a cottage without a parlour, but with a larger living room.

With regard to bedroom accommodation, it should be the general rule to make provision for three bedrooms to labourers' cottages. Instances occasionally occur in which two bedrooms may be deemed sufficient. No bedroom should contain a floor area of less than 60 superficial feet, and the windows should be designed equal in area to not less than one-tenth of the floor space.

The Site.—As regards the best and healthiest soils upon which to live, gravel, compact sand, rock, or dry chalk stand first, but choice in this respect is limited by circumstances, and whatever site is ultimately decided upon, it should be ascertained that it is well drained; if not, it should be effectually drained by means of suitable earthenware field pipes. Again, where there is a free choice of aspect, it is generally considered that a south-easterly one is best, so that some protection may be afforded from the bitter north-easterly winds and the driving south-westerly rains.

Water-supply.—The questions of water-supply and the disposal of drainage are important preliminaries connected with modern building, and full consideration should be given to them in determining the site. The Public Health (Water) Act, 1878, requires that every rural sanitary authority (regard being had to the provisions contained in this Act) shall see that every occupied dwelling-house within their district has within a reasonable distance an available supply of wholesome water, sufficient for the consumption and use for domestic purposes of the inmates of the house.

Of course, in the majority of outlying agricultural districts the idea of obtaining water from the mains of district councils, &c., is out of the question, and unless the water-pipes can be extended from the farmstead or other dwellings near at hand which may happen to be already provided with a supply of good drinking water from springs or other sources, recourse must be had to wells, of which there are two kinds, viz., deep and shallow. Of these, deep wells are to be preferred, and in sinking them the surface water should be excluded by 10 or 12 ft. of substantial brickwork, sur-

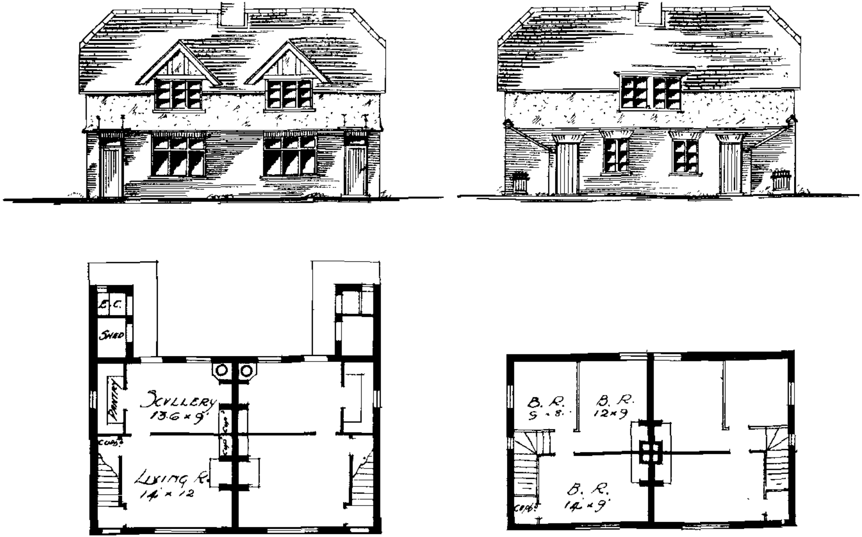


FIG. 2.—DESIGN FOR A PAIR OF COTTAGES TO COST FROM £300 TO £350.

rounded with 12 in. of clay puddle. They should never be less than 50 ft. deep, and the deeper they go the less likely is the water to be contaminated. With regard to shallow wells, it is no uncommon thing when the weather is very dry, for the water-supply to become scanty and sometimes to cease altogether. This is a proof that the water is derived from surface drainage after passing through a few feet of soil and collecting in the hollow made for it. The one great objection to shallow wells is that the water is liable to pollution to a greater degree than in deep wells. Wells, if removed from all likely sources of pollution, are better than surface streams.

It frequently happens, more particularly in the fen districts, that the sources of water-supply already enumerated are not available, and cottagers have to depend upon the storage of the rain-water for domestic purposes, or the water is pumped and carted from the dykes and drains which are so common in that part of the country. Water from the latter sources is frequently of a brownish colour owing to the fact that it has drained through peaty land; it has been proved by analysis that it is not deleterious for drinking purposes on that account, but there are risks of its being polluted by other causes.

Rain-water collected from the roofs of houses and stored in underground tanks frequently becomes polluted, and should be boiled and efficiently filtered. The tanks should be constructed of substantial concrete or brickwork in cement, and should be rendered in cement 1 in. thick or lined with pure bitumen sheeting, and should be thoroughly cleaned out three or four times a year. On no account should tanks for the storage of rain-water be lined with lead, as the lead becomes oxidised by the action of rain-water, and persons drinking the water are liable to lead poisoning.

The frequent occurrence of wells and cesspools in close proximity, and the use in villages of surface streams, make it absolutely necessary that great care should be exercised in the use of water. Unfortunately, the provision of a suitable water-supply sometimes involves considerable expense to a landowner, a recent case in Buckinghamshire working out at 22 per cent. of the actual cost of the cottage.

Drainage.—In some districts it is not usual to provide sinks, and slops and other refuse are deposited direct on to the garden; but where sinks are provided or water-closets are adopted, in districts which are so sparsely populated that the provision of a suitable drainage system becomes impracticable, cesspools are permissible. They are liable, however, to become a source of nuisance and danger to health, and should be constructed at a distance of at least 50 ft. from a dwelling-house, and, with a view to the prevention of risk of water pollution, at a distance of at least 60 or 80 ft. from any well, spring, or stream of water used for drinking purposes. They should be constructed of good brickwork in cement, rendered in cement 1 in. thick, and have a dished concrete bottom also rendered in cement, with a backing of 9 in. or 12 in. of well-puddled clay; they should be domed over in cement, and finished with a hard stone cover with a ring let in, or an iron air-tight manhole cover. The drainage to cesspools should be similar in all respects to drains connected to a regular sewer: the pipes should be jointed in cement, inspection-chambers should be provided at all turning-points or junctions, and an interceptor and a ventilating inlet and outlet to each. The chief objection to cesspools is that many of them are not water-tight, and the contents escaping and permeating the surrounding soil often contaminate the sources of water-supply: hence the necessity for careful construction. Rain-water, if not required, as well as surface water, should not be conveyed to the cesspools, but taken away clear of the foundations, and either allowed to soak away or to be discharged into a ditch or watercourse.

Where earth-closets with a fixed receptacle are provided, they should be constructed at least 10 ft. from the dwelling-houses in such a manner and in such a position as to admit of the frequent and effectual application of a sufficient quantity of dry earth or ashes, and in such a position as will admit of ready access for the removal of contents. In any case, the contents should not be allowed to remain undisturbed for a period exceeding three months. The receptacle should be formed of impervious material, the floor being raised about 3 in. above the level of the surrounding ground, so that the contents may not at any time be exposed to any

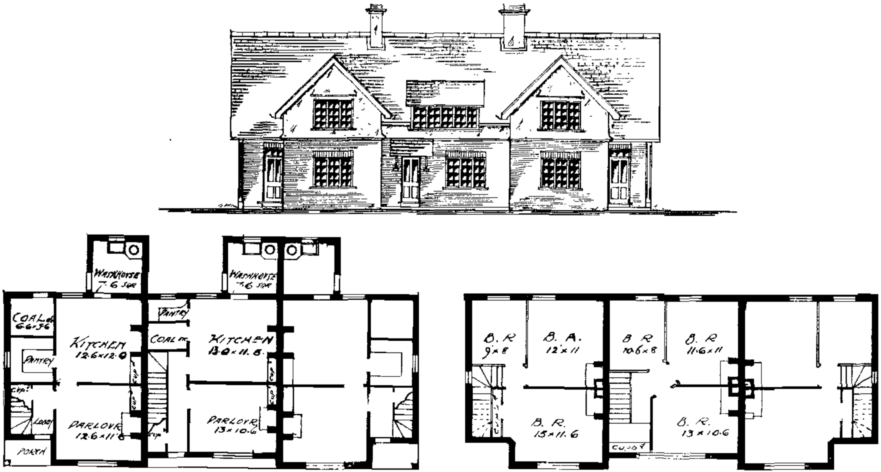


FIG. 3.—DESIGN FOR A BLOCK OF THREE COTTAGES TO COST FROM £550 TO £600.

rainfall or to the drainage of any waste water or liquid refuse.

Earth-closets with a movable receptacle, such as a galvanised pail, may be constructed in connection with a dwelling-house, but not within the same, in such a manner and position as previously described. The capacity of the movable receptable should, however, be limited in order to ensure the removal of its contents at least once a week. The seat or riser should be adjusted to admit readily of the removal of the pail. A small ledged door and frame in the back or side external wall may be provided for this purpose.

Building Materials.—A good deal of prominence has been given to the use of concrete blocks, and, where the site itself provides ample gravel and sand, and neither bricks nor stone can be obtained without the expense of cartage for a considerable distance, it is possible to build more cheaply in this manner. On the other hand, where bricks can be had at a moderate price, it is doubtful whether much saving can be effected by the use of these blocks. In any case, it is of paramount importance that the manufacture of concrete blocks should be carried out under skilled supervision; the quality of the cement, the proportion of the constituent parts, the mode of mixing, &c., being details requiring the greatest care in order to ensure satisfactory results.

In districts where stone is plentiful and available for building purposes, it is necessary to ascertain that its weathering qualities are such as would justify its use for this purpose. Where gravel and sand can be obtained on the site, care should be taken to see that they are free from all earthy or clayey matter before use, and that the sand is sufficiently sharp.

Bricks can still be obtained at very reasonable rates in many districts, and for general work, good, sound, hard, well-burnt bricks from approved yards should be used. For external facings they should be of uniform shape and colour, but for internal use thoroughly sound work can be obtained by the use of "Flettons," which can be procured in truck-loads at a low rate. The main objections to their use for external work are their unevenness of colour, and their liability to flake in much exposed situations, while for internal

work their somewhat smooth surface provides a poor key for plastering. The latter disadvantage may be remedied by a wash of cement and coarse sand, but the bricks can now be obtained properly grooved or keyed for plastering.

Foundations.—It frequently happens that the subsoil of the selected site is of a character which renders concrete under the footings necessary to a depth of 9 in. or 12 in., the object being to distribute the superincumbent weight over a greater area than would be the case were the walls built directly on the soil. If the ground be made-up ground, or uneven or variable in its strength, the concrete may also have to act as a lintel. Where the subsoil is of rock, chalk, gravel, or compact sand, footings may be unnecessary.

Walls.—Where walls are built of brick a thickness of 9 in. is usually prescribed for external walls. In some situations, however, particularly those on high ground and exposed to the south-west, it has been proved that a 9-in. wall will not prevent the damp from penetrating (though the quality of the bricks used may account for this in some cases), and in such circumstances hollow walls may be adopted.

Hollow or cavity walls serve two useful purposes: first, to preserve a more uniform temperature inside the building; and secondly, to prevent dampness extending from without to the interior of the building. The cavity between the walls should not exceed 2½ in., and should in all cases commence from the damp course. Iron ties should be either galvanised or tarred and sanded, and inserted at least three to every superficial yard, and these not directly over one another, but midway between those immediately beneath them. The heads of all doors and window openings should be protected by means of strips of lead or zinc from any moisture that may drain upon them, and should extend 2 in. beyond the ends of the woodwork.

Although the useful purposes served by hollow walls are obvious, what are known as 11-in. hollow walls are not to be recommended, as they involve a sacrifice of strength and stability as compared with a 9-in. solid brick wall well and properly built in English or Flemish bond. Opinions may differ on this point, but it seems obvious that two detached 4½-in. walls, with no additional bond beyond that of three

iron ties to each superficial yard, must be the weaker of the two. To ensure sound work, not less than 16 in. cavity walls should be constructed—at any rate, up to the first floor level. As an alternative, if 11 in. cavity walls are used, the brickwork should be built in stretcher bond in either blue lias lime or Portland cement mortar, and the roof plate bedded on the inner 4½ in. wall. Additional strength might be obtained by inserting a band of hoop iron at about every 2 ft. 6 in. or 3 ft. in height, well tarred and sanded. In either case, the cost would be increased, but the weight and thrust of the floors and roof on the walls are important factors to be taken into consideration with regard to 11 in. walls.

Chimneys and Fireplaces.—Expense is saved by forming the fireplaces on internal walls and grouping the flues into one stack. The chimney will be less likely to smoke, and the rooms should benefit by the warmth of the flues. There will also be less cutting and trimming to the roof. It is better to provide fireplaces to all bedrooms, as, apart from the convenience in cases of illness, there is no better ventilator than a fireplace. Where, however, this cannot be done, a suitable ventilator, or air brick, not less than 9 in. by 6 in., should be fixed in an external wall. One sometimes encounters people who still cling to the foolish prejudice against fresh air, and it is no uncommon thing to find these people closing the register stove-flaps or covering up the ventilators in their bedrooms.

Floors.—In many existing cottages, one frequently finds the whole of the rooms on the ground floor either cement or quarry paved. It is preferable that the living rooms, at any rate, should have boarded floors on account of the extra comfort and warmth derived from them. Wood block floors laid in mastic on a bed of concrete, and ordinary flooring boards laid in mastic and nailed to a breeze concrete bed, are sometimes adopted, but where board and joist floors are provided, it is important to keep a clear space of 12 in. between such floors and the ground. Sleeper walls should have openings left in them, and the external walls should have sufficient air-bricks built in to ensure ample ventilation.

Windows and Doors.—Casement windows seem to be

more adapted to cottages than double-hung sashes. They have, however, disadvantages compared with the latter owing to the difficulties experienced in regulating ventilation without draughts, in keeping them water-tight, and in cleaning the outside from within.

By fixing the windows flush, or nearly so, with the external face of the wall, wide window-boards can be provided, which are generally found very useful, and are greatly appreciated by the labourers' wives.

A height of 8 ft. or 8 ft. 6 in. to the rooms should be ample, and it should be borne in mind that it is not so much the height of a room which makes it conducive to health as effective ventilation. The door should act as an inlet and the window as an outlet, and for this purpose the window-opening should extend as nearly as possible to the ceiling.

Ledged doors would be in keeping with cottage architecture, but if panelled doors are provided, they should not be less than 1½ in. in thickness, owing to the liability of thin doors to twist. All fireplaces, windows, and doors should be arranged with a due regard to convenience, so as to provide ventilation with an absence of draught.

Staircases.—Stairs should be conveniently planned and well lighted. Ample headroom should be provided, a point in construction which is frequently overlooked. It is desirable to allow 6 ft. 9 in. to 7 ft. measured vertically. The width of stairs should not be less than 2 ft. 8 in. to 3 ft. A feature in planning, also, should be to make the "going" as easy as possible, and to effect this the treads should be 9 in. wide, and the rise from step to step 7 in. to 7½ in., but not exceeding the latter. Winders should be avoided as much as possible.

Pantry.—A suitable pantry should be provided to each cottage, and so arranged that one, at least, of its walls is external, in which a window can be provided for affording light and ventilation.

Scullery, &c.—A copper, either portable or built in the usual manner, should be provided for washing purposes in the scullery or in an outbuilding. By the use, at a trifling cost, of one or other of the patent steam exhausts, a good

deal of the steam can be disposed of without it penetrating the rooms when the copper is inside the building.

Provision should be made for storing some of the roof water for general washing purposes, either by tanks or wooden butts well tarred or pitched.

The yards, walks, &c., should be paved, either with cement, concrete, or hard bricks, or gravelled.

Damp-course.—There are several materials in general use as damp-proof courses. Of these, a double course of stout slates in cement 6 in. above the level of the surrounding ground and laid to break joint, is the one most commonly used, and is found to be very efficient. In certain districts, particularly in the Midlands, two courses of blue Staffordshire bricks in cement are used, and if the two courses of brickwork above and below them are set in cement mortar, an equally satisfactory result is obtained. Asphalte, as generally understood, is a mixture of bitumen and tar, and is proof against damp rising, but it is liable to squeeze out under pressure of heavy buildings in very hot weather. There are certain makes of bitumen sheeting which prove effective for damp courses. On no account should asphalted or tarred felt be used. It is cheap and is used largely in speculative work, but it is inefficient as a damp-proof course, and soon perishes. Its use should therefore be discouraged.

Sills.—With regard to window-sills, stone is mostly used; slate is also employed in certain districts. Croft granite stone for sills, steps, &c., has also proved satisfactory. It weathers well, and the cost is about one-half that of ordinary stone. Two courses of quarry tiles, set sloping and well bedded and pointed in cement, are also cheap and efficient. Then there are purpose-made sill bricks, but those of Staffordshire make are to be preferred. Cemented brick-on-edge-in-cement sills are frequently adopted, but unless the cement is of the best quality and the work well performed, they are liable to crack and disintegrate.

Tiles and Slates.—Tiles and slates form the chief coverings for roofs. Of the former, plain sand-faced tiles and the the Broseley or similar nib tiles are the best. Pan tiles form a cheaper covering, and are sometimes used, but they are not a desirable covering for roofs of dwelling-houses. Tiles

of ornamental pattern are sometimes used, but the question of expense usually prohibits their use for cottages. A tiled roof should have a pitch of not less than 40°. Ordinary slates are a cheaper form of roof covering than tiles, but should not be laid to a less pitch than 30°.

There are also several artificial substitutes on the market in place of tiles and slates. The asbestos-cement slates seem to be rapidly rising in favour in some parts of the country, but it has yet to be proved that they are as durable as good Welsh slate. The advantages claimed for them are that they are light, weather-proof, non-conducting, and economical, the cost being stated to be less than one-half that of Broseley tiling. The rafters are usually spaced 2 ft. apart, thus effecting a saving in the timber as compared with the spacing for ordinary slates.

This article has been devoted to the general treatment of the subject, and has aimed at setting forth the main principles on which unpretentious but useful cottages can be provided for labourers at a reasonable cost, without sacrificing comfort or durability. The accompanying designs will serve to illustrate how such cottages can be erected, at the prices stated, to meet the present-day needs of agricultural labourers.

SWIFT MOTHS (*Hepialidae*).

R. STEWART MACDOUGALL, M.A., D.Sc.

THE *Hepialidae* are an isolated family of moths showing some primitive characters. There are five British species. Three of these feed—in the caterpillar stage—on and in the roots and rhizomes of the bracken fern (*Pteris aquilina*). The two troublesome species are the Small Garden Swift Moth (*Hepialus lupulinus*, L.) and the Ghost Swift (*Hepialus humuli*, L.). The caterpillars feed underground.

Hepialus lupulinus.—The caterpillars of this moth are very destructive; their food plants belong to many Natural Orders. In the past three years the caterpillars have been reported to the Board as damaging—often severely—the underground parts of daffodils (the bulbs especially), peonies, dahlias,

chrysanthemums, and lily-of-the-valley. In the literature there is a long list of host-plants:—grasses, oats, snowdrop, colchicum, gladiolus, lily, peas, beans, strawberries, raspberries, parsnip, celery, parsley, potatoes, horehound, white and purple dead nettles, phlox, *Chelone barbata*, lettuce, auriculas, and dock.

Description.—Moth: The moth varies in colour and in size. In spread of wing the measurement is from 1 inch to 1½ inch. The male has the thorax and abdomen yellow-brown. The front wings are brown—sometimes lighter, sometimes darker—with a white stripe that runs from the middle of the base of the wing, and parallel for a short distance with the hind edge of the wing, when it then suddenly bends and runs obliquely across the wing to near the apex. About the middle of each fore-wing is a white spot or dash. The hind-wings are purple-brown or smoke-coloured, with pale brown fringes. The female moth has the same general colour as the male; the markings, however, are not so distinct, and may be absent. Antennæ and legs are short in both sexes.

Larva: The caterpillar has sixteen legs, and measures four-fifths of an inch when full grown. It is whitish or yellowish-white in colour; the head is brown, as is also the plate or shield on the upper surface of the joint behind the head. The other segments of the body show dark or light dots on their upper surface, and each dot carries a stiff black hair; the spiracles are black.

Pupa: The pupa is shining red or pale brown, with the head and wing cases darker. The segments of the abdomen are markedly divided off from one another; five of them have horny ridges with projecting teeth on their upper surface, and four of them have similar spines on the under surface. The pupa is enclosed in a delicate cocoon; within this cocoon the pupa, on being touched, wriggles violently. Before the adult moth issues the pupa presses itself out of the cocoon and above the surface of the soil so as to allow of emergence of the moth.

Life History.—The moths are found in May and June, but stragglers may be found later. They appear about dusk. The male is a very active flier; the female is more restful, hanging to some grass or other stem, and attracting the male by a

rapid vibration of her wings. After pairing, the female flies among herbage and drops her eggs as she flies. The caterpillars live underground, and feed from late June on through July and to the next April or May, *i.e.*, they remain in the caterpillar stage all the winter, feeding more or less continuously in open winters, and going a little deeper, during frost, for protection. Pupation of the full-fed caterpillar takes place at the end of April, in May, and in June.

Hepialus lupulinus is common over England and Wales, but not so common in Scotland, although it has been taken as far north as the Orkneys; it is also found in Ireland.

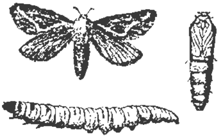
Hepialus humuli.—The caterpillars of this moth are also troublesome enemies. A correspondent of the Board who sent one of the caterpillars taken from a carrot tunnelled by it, wrote that the caterpillars had been very destructive to this crop, and that frequently he dug them up with the spade whilst digging a new plot. Curtis in 1848 recorded a similar attack on a carrot, the caterpillar being found in "a cavity 2 or 3 inches long." Theobald and others have recorded this caterpillar as destructive to the roots of hops; on the Continent it is a proved enemy of hops, tunnelling in the roots. Carpenter has recorded the caterpillar as attacking potatoes and the roots of oats in Roscommon. Barrett gives as food-plants dandelion, dead-nettle, Jerusalem artichoke, and asparagus. It feeds also at the roots of burdock, nettle, and dock.

The Ghost Moth is common in Britain from north to south, and in Ireland.

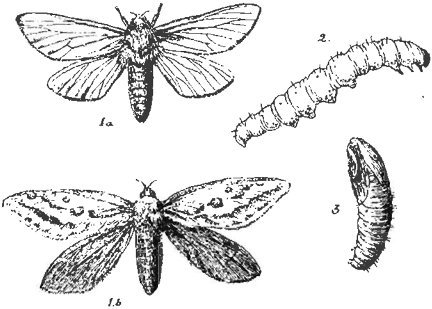
Description.—Moth: The moth measures from 1½ to 2¾ inches in spread of wings. There is a marked colour difference between the male and the female. All the four wings of the male are usually silvery-white, but the hind wings may be greyish. The fore-wings of the female are broader and are yellow, with orange or brown-red markings; the hind wings of the female are greyish, and tinged with red at the apex. The female varies somewhat in colour, and there is in Shetland a variety in which the colour of the male approaches that of the female.

Egg: The eggs are small and round. Barrett describes them as greenish when first laid, but becoming black.

Larva: The caterpillar measures 1½ inches when full



Small Garden Swift Moth (*Hepialus lupulinus*).
(Natural size.)



Ghost Swift Moth (*Hepialus humuli*).
1*a*, Male; 1*b*, female; 2, caterpillar; 3, pupa.
(All natural size.)

grown; in colour it is whitish or pinkish-white, with the spiracles black. The head is red-brown, as is also the dorsal plate on the joint behind the head; there are black or dark-brown dots on the upper surface of the segments of the body, with black hairs.

Pupa: The colour of the pupa is dark chestnut; the upper surface of the abdominal joints shows a number of dark brown points, and there are black teeth on the under surface; the last segment has marked black points. The pupa is enclosed in a slight cocoon, and lies in the soil quite near the surface.

Life History.—The moths fly in June and July. The courtship of this species has been described by Chapman.

The moths fly in the gloaming. The male, ghost-like and conspicuous by the silvery white colour in spite of the dusk, chooses a place and hovers for a short time backwards and forwards, "swaying like a pendulum over a surface of about a yard" (Barrett) in order to attract the female. Sometimes the male is alone, sometimes there are several males in company. The female, non-fertilised, flies towards a male and intentionally touches or knocks up against the male, which at once ceases its swaying and drops to the ground, where pairing takes place. The fertilised female flies about over the grass, discharging her eggs as she flies. From the egg hatches the caterpillar, which feeds from July till the next April or May at least, when pupation takes place. As with the last species, the pupa leaves the cocoon just before the emergence of the moth, and by means of its spines wriggles to the surface.

Treatment.—Vaporite has been used with some success against swift caterpillars.

Pieces of potato tuber placed here and there some inches below the surface of the soil, in marked places, will serve as traps.

The working of the soil where the crop allows, and the turning up of the caterpillars to the birds is a useful measure, or the caterpillars can be collected.

In some cases, *e.g.*, with daffodils, should the pest be abundant, the bulbs should be lifted and replanted. There are disadvantages to this course, but in some cases the

measure will be practicable. In a confined area where the caterpillars are at work the use of bisulphide of carbon injected into the soil would destroy them.

In addition to birds, there is help from nature from moles and from two species of parasitic fungi, viz., *Cordyceps militaris* and *Cordyceps entomorrhiza*.

The Administration of the Small Holdings Act in 1910.

THE Report of the Small Holdings Commissioners on the administration of the Small Holdings Act during the year 1910 has recently been issued [Cd. 5615. Price 3½*d*.]

Considerable progress has been made during the past year in satisfying the demand for small holdings, and the position on the 31st December last was that 89,253 acres had been actually acquired or agreed to be acquired for small holdings by County Councils in England and Wales, of which 53,642 acres had been purchased for £1,695,836, and 35,611 acres leased for rents amounting to £44,489. Of this land 65,923 acres had been actually let to 4,846 individual small holders, and 52 acres sold to seven small holders. In addition 3,454 acres had been let to 27 Co-operative Small Holdings Associations, who had sublet the land to 490 of their members, and 2,192 applicants had been provided with 27,000 acres by private landowners direct, mainly through the instrumentality of the Councils. The land which has been acquired but not yet allotted will probably provide for another 1,500 applicants, and it will therefore be seen that the Act has resulted in the provision of land for approximately 9,035 applicants in three years.

During 1910 fresh applications were received by County Councils from 4,003 individuals and seven Associations for 70,253 acres, bringing the total number of applicants since the Act came into operation up to 30,886 and 34 Associations, and the total quantity of land applied for up to 507,377 acres. Of these applicants 17,595 had been provisionally approved for 256,134 acres up to the end of 1910. From returns supplied by County Councils the number of applicants remaining on the Council's books for whom land had not been acquired or

agreed to be acquired was 8,168 and seven Associations, and the quantity they require is 127,256 acres, but it seems clear that these figures are considerably in excess of the genuine outstanding demand. It has been found that a considerable number of the applicants who had been provisionally approved in the first instance are inclined to withdraw when a definite offer of land is made to them, and others on further investigation have had to be rejected as unsuitable. As was pointed out in the previous report, the problem before the Councils has been to fit particular men to particular land, and very few of the applicants are willing to move from their immediate neighbourhood. In many cases also the rents which Councils are bound to ask to recoup their outlay on the acquisition and adaptation of the land are higher than the applicants expected or are willing to pay, and many applications have been withdrawn on this account. A considerable number of applicants have obtained holdings from private landowners.

After discussing the action taken in different districts, and other matters arising in connection with the Acts, the Small Holdings Commissioners observe that: "The provision of over 9,000 small holdings through the instrumentality of the Act in three years is a result which reflects great credit on the various Councils concerned. With very few exceptions they have lost no opportunity of providing for the needs of all suitable applicants, and we are satisfied that in the great majority of counties the work could not have been done more quickly without serious risk of disaster. The truth is that the demand for small holdings has been so large that it would have been impossible to have satisfied the whole of it in two or three years, and in view of the fact that negotiations for the acquisition of land necessarily occupy a considerable time that a great deal of land which could have been acquired is either unsuitable or too expensive, and that as a rule the land has had to be acquired in those localities where there is most competition for it, the results achieved cannot be regarded as anything but satisfactory. It is inevitable that some of the applicants should consider that there has been unreasonable delay, but that this is in most cases not the fault of the Councils is shown by the fact that in those counties where

the Act has been vigorously administered ever since it came into operation, such as Norfolk, Somerset, and Cambridge, the unsatisfied demand from suitable applicants still remains a very large one, even after three years' hard work. In Norfolk 3,610 acres are still required for 316 applicants, in Somerset 11,588 acres for 873 applicants, and in Cambridge 6,510 acres for 513 applicants.

"The Board are bound to see not only that the reasonable demands of suitable applicants are satisfied with as little delay as possible, but also that the Act is administered in such a way that the interests of sitting tenants are not unjustly affected. If there had been any ruthless disturbance of sitting tenants it would have aroused such a storm of indignation that the success of the whole movement would have been jeopardised, while if unsuitable men had been placed on the land it would inevitably have resulted in a considerable charge being thrown on the rates. If the small holdings movement is to be the permanent success for which we hope, it is essential that it should be carried out with the hearty co-operation of all classes connected with the land, and with the minimum amount of friction and hardship."

Changes in the Number of Small Holdings.

THE Report referred to above shows that considerable progress is being made in the provision of small holdings in England and Wales, but owing to the annual transfer of a substantial area of land from agriculture to other purposes there is at the same time a movement in the contrary direction which prevents the net increase in the number of small holdings from being as great as it would otherwise be. This point is discussed at some length in the Report on the Acreage and Live Stock Returns for 1910 (Cd. 5585. Price 5½*d*.).

The changes which have taken place since 1890 in the number of holdings exceeding one acre and not exceeding 50 acres are shown in Table A on the next page.

During the two years 1908 to 1910 the net addition of holdings of this size was 1,482 in England and 144 in Wales, making a total of 1,626. This represents a striking change in the tendency which these returns had previously exhibited.

From 1903 to 1908 the number of small holdings in England and Wales diminished by 3,495. Prior to 1903 the latest available figures as to holdings of different sizes are those resulting from a special inquiry in 1895, and from 1895 to 1908 the loss of small holdings in England and Wales amounted to no less

TABLE A.

Year.	England.	Wales.	Total of England and Wales.
1890*	267,346	41,944	309,290
1895	257,646	41,732	299,378
1903	248,936	41,735	290,671
1904	248,104	41,895	289,999
1905	247,854	42,013	289,867
1906	246,934	41,992	288,926
1907	246,896	42,197	289,093
1908	245,102	42,074	287,176
1909	245,856	42,155	288,011
1910	246,584	42,218	288,802

* The holdings of one acre have been deducted in the proportion ascertained in 1895.

than 12,202. At the previous inquiry in 1890 holdings of precisely one acre were included, whereas in later years they were excluded, so that an exact comparison is not possible. An estimated number of such holdings has, however, been deducted from the total of 1890, so as to obtain a comparable figure, and on this basis the loss of small holdings between 1890 and 1895 was 9,912. It may be calculated, therefore, that during the 18 years 1890 to 1908 the reduction in the number of small holdings amounted to 22,000.

The addition, therefore, of 1,626 in the two years 1908 to 1910 affords evidence of a strong counteracting influence to the previous tendency.

The figures in these returns record the net result at the end of the year of the changes which have taken place, from various causes and in opposite directions, during the preceding twelve months. This is especially the case in regard to the number of holdings. It is evident that by the contraction of the cultivated area—the acreage under crops and grass—a considerable number of farms must disappear every year, absorbed for the most part by the unrelenting growth of the urban districts. This process of absorption probably affects the number of small holdings to a greater extent than those

of larger holdings, partly by reason of the fact that small holdings tend to cluster around towns, and are therefore more immediately within the sphere of urban encroachment, and partly because the absorption of an equal area may involve numerous small holdings, or only one large holding. It is clear, therefore, that the creation of a very considerable number of new small holdings must be represented when the balance of gains and losses in this class shows a net addition in two years of 1,626.

As the number of small holdings provided under the Act in 1908 and 1909, according to the particulars furnished to the Board by the local authorities, was 4,443, it seemed desirable to ascertain whether the net increase in this class of holdings, as shown in these returns, fully represented the results of the movement known to have taken place. Special inquiries were accordingly made in certain counties where the returns appeared to be somewhat inconsistent, and a considerable amount of detailed information was obtained. It was found, as was anticipated, that in many cases the creation of small holdings in one district was accompanied by their absorption in another district. This absorption was mainly for building purposes, but in some cases the few acres of the small holder were taken into a larger farm. The ambition and success of the small holder himself was found to be the cause in some instances of the disappearance of an adjoining holding, which at the first opportunity he had acquired, so as to increase his own occupation, while still remaining a small holder. Of those provided with holdings under the Act a considerable proportion had previously occupied small parcels of land which, if above an acre, would have been reckoned as small holdings. In fact, the replacement on the land of small holders displaced by the process of absorption already referred to is evidently one of the satisfactory results achieved under the Act. In one county, out of 194 small holdings provided, 123 were taken by persons who had previously occupied land. In another county, in the same year in which 59 small holdings were provided under the Act, 12 small holdings, comprising in the aggregate 27 acres, were consolidated into one small holding. Again, near a large town it was found that a number of holdings above one acre but less than 50

acres had been formed into allotments, *i.e.*, occupations of less than one acre, and would thus cease to be included in the agricultural returns, the change being recorded as a decrease of small holdings. In another county it was found that a considerable number of holdings had been taken by associations, and that the association and not the individual holders, had been reckoned as the occupier for the agricultural returns. In some cases plots of land returned as separate holdings provided under the Act did not exceed one acre, and would therefore not be included as holdings in these returns.

The Paris Fat Stock Show of 1911.

THE Annual Fat Stock Show at Paris was held this year from the 23rd to 27th February, in the Grand Palais des Champs-Elysées, the show of breeding stock which used to be held in conjunction with it being now held separately in June. A member of the staff of the Board of Agriculture and Fisheries attended this Show, and some extracts from his report are given below.

Entries.—The entries were:—Cattle, 223 head; sheep (pens of 3), 115 pens; sheep (groups of 15), 11 groups; pigs (single animals), 59 head; pigs (groups of 3), 19 groups. For the purpose of comparison it may be noted that the entries for the Smithfield Club Show in 1910, excluding those entered for the carcass competitions, were 289 head of cattle, 170 pens of three sheep, and 117 pairs and 36 single pigs.

Although there are said to be forty varieties of French cattle, only fifteen breeds were met with at the Show. These were the Charolais, Nivernais, Normand, Limousin, Garonnais, de Salers, Bazadais, Parthenais, Marchois, Gascon, Bourbonnais, Basquais, Breton, de St. Girons, and Cotentin, while in addition several crosses were exhibited.

The Prix d'Honneur for the best ox in the Show was awarded to a three-year-old Nivernais, which weighed 20 cwt. 1 qr. 22 lb. The Prix d'Honneur for the best cow fell to a three-year-old Charolais, which weighed 18 cwt. 1 qr. 24 lb. The Prix d'Honneur for the best group of bullocks without distinction of age or race was taken by four Charolais animals. These three championships all fell to one exhibitor, MM.

Dodat frères, and included only the Nivernais and Charolais breeds.

Charolais Breed.—The Charolais is a handsome white animal, which stands in the front rank of French cattle for value and importance. This race originated in the district of Brionnais, in the province of Charolais, and is found to-day throughout the centre of France. The early breeders of this race very carefully prevented the introduction of foreign blood, but subsequently breeders in the Nivernais district introduced the Shorthorn, and as a result of judicious crossing with that breed produced a variety called the Nivernais or Charolais-Nivernais, which possesses several marked improvements on the original stock. In order to retain the almost pure white colour that is a characteristic of the Charolais, the greatest care has to be taken in selecting the Shorthorn for this cross. Not only must the beast itself be of a pure white colour, but it must come of a pure white stock, or signs of reversion to type would appear in the offspring.

The Charolais-Nivernais grows to a large size, and is the finest breed in France for work and beef. The cows are, however, poor milkers, and in most cases can do no more than feed their young. In the districts where the beet sugar industry is extensively followed this breed is very prominent. The animals are of great service in preparing the land, and they fatten well on the pulp of the beetroot. The bulls sell at the shows held in February at prices varying from £20 to £48, and up to £80.

Several interesting specimens of Shorthorn-Charolais and Shorthorn-Nivernais crosses were to be seen at the Show. The ameliorating effect of the Shorthorn is very strongly marked in the improvement of the flesh-making parts and the lessening of the waste portions. It would appear that the gain in these respects is of considerably greater value than the small loss of labouring power which is said to result from these crosses. It would be interesting to see the result of a cross between the Charolais and an Aberdeen-Angus.

The Normand Breed.—The Normand breed, which is the dual purpose animal of France, sometimes reaches an enormous weight, but is of slow growth, being five or six years old before being fit for the butcher. Animals have been

known to exceed 35 cwt., but the weight of the 1st prize Normand at the Paris Show was only 19 cwt. at 3 years 3 months.

The most notable characteristic of this breed is, however, its milking quality. A good cow will yield nearly 750 gallons of milk per annum, and has been known to give nearly 10 gallons a day at the height of its lactation period. A yield of 35 pints a day is not rare. The average proportion of butter contained in the milk is 5·62 per cent. The prevailing colour is brindled, red and white.

The Limousin Breed.—The Limousin, the principal centre for which is Haute Vienne, probably ranks next in importance amongst French cattle. This breed is of a smaller build than either the Charolais or the Normand, but its formation is more stylish. It has a well-proportioned head, a long straight back, and short, well-covered legs. The colouring is very regular, being a light brown, broken only by a pinkish muzzle and a pinkish rim round the eyes. The Limousin is regarded as a fine beef producer, it fattens well, and its flesh is in great demand in the French markets. It is also a good working animal. As a milk producer it is but very ordinary, although attention is now being paid to a careful selection of animals with a view to improving its milking qualities. The winner of the first prize in the class for this breed at the Show weighed 16 cwt. 2 qr. at 3½ years.

The Garonnais Breed.—The Garonnais is very similar in formation and colouring to the Limousin, but the development of muscle is rather more marked. This points to a greater aptitude to work than to provide flesh for the butcher. As its name implies, it is bred in the Garonne district between Toulouse and Bordeaux. There are two varieties of this breed, the one met with in the valley of the Garonne being a larger and more valuable animal than that of the higher plains and hills. The cows are very poor milkers. The weight of the first prize animal at the Show was 19 cwt. 6 lb. at 4 years of age.

The Salers Breed.—The Salers breed is noteworthy inasmuch as it combines probably more than any other French breed the three qualities—production of milk and flesh and suitability for labour. The home of this breed is in the

department of Cantal, and it is found on the volcanic but fertile plains of the Haute-Auvergne. The formation is strikingly regular, a characteristic being the large up-turned horns. The colour is an even dark red. The bullocks are good workers, and their flesh is highly esteemed by restaurateurs on account of its good flavour. The cows give an average of 32 to 35 pints of milk a day. It is from this milk that the Cantal cheese is made. The first prize animal weighed 18 cwt. 8 lb. at 3½ years of age.

Other Breeds of Cattle.—The Bazadais has a similar conformation to that of the Garonnais, but the colour is darker. It is greatly valued in the south-west of France for its working qualities. It fattens well, and the flesh is highly esteemed. The first prize beast weighed 16 cwt. 2 qr. 22 lb. at 4 years of age.

Of the other French breeds to be seen at the Paris Show mention may be made of the Breton, which is somewhat similar to the Kerry. The principal characteristic of the Breton is the quality of its milk. The cows yield from 10 to 20 pints a day, but a pound of butter is obtained from 17½, and in some cases from 13, pints of this milk.

Of the four animals entered in the class for Durham, or Shorthorns, the beast securing the first prize was a moderately fine specimen weighing 19 cwt. at 3 years of age.

The heaviest beast in the Show was an unnamed cross—probably a Charolais-Durham, weighing over 24 cwt. at 4 years of age.

Sheep.—The most striking point in the sheep section of the Show was the prominent part taken by breeds of English origin and of French sheep that have been improved by crossing with English breeds. The Prix d'Honneur for "the best pen of three sheep of foreign breeds or crosses between foreign and French breeds" was secured by Southdowns, which weighed 4 cwt. 3 lb. at 11 months. The Southdown was introduced into France in 1855. The Comte de Bouille was one of the first French breeders to create a flock of this breed for improving some of the French races, notably the Berrichon. The name of M. Nouette-Delorme is also connected with the establishment of the breed in France.

This breeder is said to have created the finest flock of Southdowns in France, and has done much to establish the breed in the favour of his compatriots. The champion pen of Southdowns at the Show was exhibited by MM. Dodat frères, the breeders who secured all the championships in the cattle classes. The Prix d'Honneur for "the best group of fifteen animals" was also secured by the Southdowns, these being exhibited by M. Thome. These sheep weighed 14 cwt. 2 qr. 16 lb. at 10½ months. The other Prix d'Honneur for "the best sheep entered in the class for French breeds" went to a pen of three Charmois, which weighed 3 cwt. 2 qr. 11 lb. at 11 months.

The Charmois is a most interesting breed of sheep. It is probably the best mutton-producer of all the French sheep, and it is a triumph of the breeder's art. The credit of its origin is due to M. Malingie, who fixed the type after a long and expensive series of cross-breeding experiments at his farm, La Charmoise, in Loir-et-Cher. The Charmois is the outcome of a cross of the Mérino, the Tourangeau, the Solognot, and the Berrichon with the "New Kent" breed. It is half English, inasmuch as it is formed of an eighth of the blood of each of the four breeds mentioned above with four-eighths of the "New Kent" blood. The symmetry of this breed is excellent; it has a small head, and a broad and compact body with shortish legs, well covered with mutton. It is noted for its precocity and its capacity for producing good mutton. It is able to adapt itself to flat or mountainous country, and is consequently found in every part of France, in Algeria, in the Congo, in Argentina, and in Roumania.

Another breed of English origin, the Leicester, or Dishley, as it is called, is much appreciated in France for crossing with native breeds; in fact, there is considerable argument between the votaries of the Dishley and those of the Southdown as to which breed is the better for grading-up purposes.

The examples of some of these crosses to be seen at the Paris Show included crosses of the Dishley with the Limousin, the Charmois, the Mérino-Charmois, the Mérino-Berrichon, and the Berrichon, and of the Southdown with the Berrichon, the Limousin, and the Bizet.

A Dishley-Berrichon and a Southdown-Berrichon secured

the first prize in their respective classes of long- and short-woolled crosses. The former weighed 3 cwt. 1 qr. 25 lb. at 12½ months, and the latter 2 cwt. 3 qr. 13 lb. at 11½ months, whereas the Southdown-Berrichon that was awarded the second prize in the short-woolled cross weighed 3 cwt. 2 qr. 19 lb. at 12 months.

These specimens did not enable a distinction to be drawn between the merits of these two crosses, but it would appear that the Berrichon is the best amongst the French breeds for crossing with either of the English ones.

An interesting cross was that of the Southdown-Bizet, in which the improvement of the native breed was decidedly marked. The Dishley-Mérino also showed a striking improvement on the famous wool-producing breed. There was a small class of pure Mérinos, and although much has been done in France to improve the flesh production of this breed, it still looks somewhat out of place at a fat stock show. This is, in fact, true, judging from an English standard, of most of the other breeds exhibited: the Berrichon, the Lauraguais, the race of the Pyrenees, the Bizet, the Montagne-Noire, and the Lacaune. They all have large heads, narrow backs, long legs, and a poor covering of flesh, and, judging from the small patch that it is customary to leave on either flank of an animal exhibited on the Continent, the wool is not nearly good enough to make up for these deficiencies. Some of the breeds, such as the Lauraguais, are kept primarily for milk.

It is perhaps unfair to judge the French breeds by the English standard, as in France neither the system of cultivation nor of land tenure are conducive to the rearing of a similar class of sheep to those found in this country, added to which there is a comparatively small demand for mutton. The demand for mutton could, no doubt, be increased by a general improvement in the class of meat placed on the market, and this could, perhaps, best be done by a more general use of English breeds for grading-up the native animals.

Pigs.—The pigs were mostly Craonnais and Normands, with a number of crosses between these breeds, and a few Yorkshires. The Prix d'Honneur for the best pig was

awarded to a Craonnais, aged 12 months, which weighed 6 cwt. 3 qr. 3 lb. This heavy weight, of course, meant an enormous quantity of fat, but the breed as a whole has an excellent reputation. It claims with the Normand a strong tendency to produce more flesh than fat.

The Yorkshire is now fully adopted by the French breeder, who claims that his animals may be compared to their advantage with the breed in this country. The early maturity of the Yorkshire strongly appeals to him, as he is able to rear and prepare for the butcher three lots of this breed in the same time as it would take to bring two Craonnais or Normands to perfection. The first prize in a class for foreign breeds was a Yorkshire weighing 4 cwt. 2 qr. 17 lb. at 11½ months.

Poultry.—In the poultry section, which included some eleven hundred lots of exhibits, the prize for the best birds in the French classes was awarded to a pair of La Flèche birds, and that for the best in the foreign classes to a golden gamecock and two hens exhibited by M. Pichot, of Paris.

Indian Wheat.

A PAPER on "Indian Wheat for the British Market," by Sir James Wilson, recently published by the Government of India, contains matter of much interest to agriculturists in this country. The most remarkable fact in connection with Indian wheat is that it fetches on the average three shillings more per quarter in the English market than home-grown wheat, in spite of the fact that it contains a higher proportion of impurities, and is less uniform in quality. It is well known that Canadian wheat also commands a higher price than British grown, but in this case the difference is apparently due to the superiority of the former in providing a flour of better baking quality: in the phraseology of the trade Canadian wheat is "stronger" than British.

The annual imports of wheat and flour from abroad average 114 million cwt., to which the principal contributors are: United States, 27 per cent.; Argentine Republic, 19 per cent.; India and Russia, 14 per cent.; Canada, 12 per cent. India has not always occupied such a high position. The gradual diminution of the supplies from the United States, and the

absence of drought in India during the last decade have tended to stimulate the exports from the latter country. There is a very general impression that the staple food of the natives of India is rice, but it is evident from Sir James Wilson's figures that only one eighth of the total produce of wheat is exported, and that no less than seven million tons are retained for home consumption. It is estimated that the average out-turn per acre is 11½ bushels; but in comparing this figure with that for the United Kingdom—31 bushels per acre—it must be remembered that much of the wheat produced in India is grown without irrigation during the "dry" months, a season which is co-extensive with the whole period of growth—October to March. On irrigated lands, the average out-turn is probably not less than 15 bushels per acre, a remarkable figure if it be borne in mind that very little farmyard manure and no artificial fertilisers are used by the Indian cultivator. Most of the former is used for fuel, while the cost of the latter places it beyond the means of the cultivator. For France the figure is 19, and for Australia only 9 bushels per acre.

The diversity of the varieties of wheat grown in India is very large. The head botanical expert attached to the Government Research Station at Pusa has enumerated and described 37 distinct botanical varieties, and has recorded the remarkable fact that the choicest qualities are retained for home consumption. That most in demand for export is a soft white variety deficient in "strength," and chiefly sought after on account of its great dryness and easy milling quality.

In discussing the future of the Indian wheat trade, Sir James Wilson states reasons for anticipating an increase in the world's supply of wheat, especially in Canada, the Argentine Republic, Russia, and India, due to the ever extending area of cultivation; but since it seems likely that the world's demand will keep pace with the supply, the present level of prices is likely to be maintained. For some years to come the writer is confident that the average price of imported wheat will not fall much below thirty-five shillings per quarter.

The principal factors which determine the value of wheat in the wholesale market are examined by Sir James Wilson, and as some obscurity exists on this subject, it may be of interest to recapitulate his conclusions. The value of wheat is

influenced by its cleanness, purity, quality, uniformity, dryness, milling quality, strength, and colour.

Cleanness means the absence of useless impurities.

Pureness means the absence of grains of other food plants.

Quality depends upon care in harvesting and absence of damaged or immature grains.

Uniformity denotes the absence of varietal differences.

The milling quality desired by the miller is found in a wheat, on the one hand, neither too woolly and tough, nor, on the other, too flinty and hard.

Strength is defined as the capacity of making large and shapely loaves. (There is some dispute among experts as to what physical characteristics this quality is dependent on; there appears to be little doubt, however, that it is connected in some degree with the presence or absence of phosphates in the grain. It is in this quality that most home-grown wheats are deficient.)

In this list the factors of direct interest to the agriculturist are uniformity, milling quality, and strength. The most important factor of all to the farmer is naturally absent from the above catalogue, and that is, cropping power. It is obvious that a difference of five shillings per quarter is of little importance to the home agriculturist if he can increase his outturn by more than 10 bushels per acre, but it should not be assumed, as it is often done, that the superiority of foreign wheats in, say, strength, or milling quality, is wholly due to climatic causes. The little scientific work that has been done in this country in connection with this subject goes to show that there is no reason why high cropping capacity should not be associated with better quality from the miller's point of view. It should also be borne in mind that while much is known as to difference of variety, as judged by external characters, very little has been done in distinguishing varieties when classified according to their crop-producing or other economic qualities only. The improvements that can be effected by a thorough study of economic qualities of varieties can be illustrated by the work done by the botanical experts in the service of the Government of India. Sir James Wilson reproduces a report by a leading miller in this country on some samples of wheat selected from the many varieties culti-

vated in India by Mr. Howard, of the Pusa Research Station. This report goes to show that it is possible to isolate from the mixed stocks grown in that country wheats of practically any association of characters, and of many diverse types, ranging from emmer, probably the first cereal cultivated by man, to wheat of a quality rivalling that of No. 1 Manitoba Hard.

The Caraway Seed Industry in Holland.

The caraway plant (*Carum carvi*) is a biennial, about 1½ to 2 feet high, which is cultivated for its seeds in some parts of England, particularly in Essex and Kent, and also in Holland, Germany, and Northern Russia. The seeds are used in confectionery, and also for flavouring spirits. On the Continent it is largely used for the distillation of *kümmel*, and for the production of an essential oil known as caraway oil, which is used for perfumery and medicinal purposes. The caraway oil imported into this country appears to come chiefly from Holland, where the area under cultivation has recently been greatly extended, and was in 1910 about 19,500 acres. The crop is grown chiefly in North Holland, Groningen, Zeeland, and North Brabant. A memorandum as to the method of cultivation in that country has been supplied to the Board through the Foreign Office by the Dutch Ministry for Foreign Affairs, in which it is stated that caraway is well able to withstand the cold of winter, though a cold, wet, early summer is prejudicial to growth. In the Netherlands and in more northerly regions, even in the extreme northern districts of Scandinavia, it can be cultivated without difficulty.

It grows in various kinds of soil, especially in a medium clay, but deeply tilled fertile soil, rich in humus and free from weeds, is probably most favourable.

Cultivation.—Caraway is a biennial plant, and therefore produces its seed the second year. For this reason it is sown under the cover of other plants, usually the pea. This plant, especially varieties with short stalks, does not choke the young caraway plants, and as it ripens comparatively early the caraway is able to develop strongly in the autumn after the peas have been cut. In the province of North Holland caraway is also grown under mustard and poppy when culti-

vated for seed. In the province of Zeeland it is sometimes grown under field and other beans. In the province of Groningen, where of recent years peas have suffered much from disease, some growers have adopted the practice of growing caraway among flax, with which white clover is also sown. In the first year the flax is harvested, in the second year the land is covered with white clover, and it is only in the third year that the caraway seed is completely harvested.

As a rule, caraway seed is sown simultaneously with or immediately after that of the covering plant, mostly towards the end of March or in the beginning of April, and usually in rows, so that the soil between the rows can be tilled by machinery or by hand. Before the seed is sown it is carefully mixed with the seed of the covering plant. Machines have been constructed which sow the caraway seed and the seed of the covering plant at the same time, but keep each kind separate. The seed of the covering plant is also sometimes sown first and caraway seed afterwards. The distance between the rows averages from 12 to 16 inches, and the quantity of seed sown is from 5 to $8\frac{1}{2}$ lb. per acre. Broadcast sowing is less customary.

After the covering plant has been cut, the caraway begins to thrive well. Great care is devoted to the destruction of weeds by harrowing, hoeing, &c.; and towards the winter the rows are earthed up so as to cover the plant somewhat with earth. It is customary to cover the rows in winter with earth taken from ditches, or to dress them with stable manure, while in the event of the crops being in a bad condition, manuring with nitrate of soda in the autumn and early spring is of much assistance. In any case, every effort should be made to cause the crop to thrive the first year, as this determines the yield the next year. Caraway can never be too luxuriant; for this reason nitrate of soda should be given, even when the condition of the crop is normal.

The next spring the ground is again harrowed and hoed in order to loosen the soil and to remove the weeds. The caraway then soon begins to grow fast, blossoms in the second half of May, and is ripe towards the end of June or in the beginning of July. At this time the fruit has turned brown, and falls off easily.

Although the caraway is a biennial plant, only a part of the plants grow seed-stalks in the second year. On this account the plants can be allowed to remain a further year so as to permit of seed being harvested that year also. As a rule this second harvest is not so large as the first one. For this reason this method is only applied now and again in the province of Groningen.

Insect Pests, &c.—Caraway has only a few enemies. The stalks are sometimes attacked by *Sclerotinia Libertiana*, Fl., which disease also attacks rapeseed. The worst enemy is the caterpillar of the caraway moth, *Depressaria nervosa*, Haw., which often enough destroys whole fields of caraway. The caraway moth passes the winter as a moth, and lays its eggs in March or April on various umbelliferous plants. In May the first caterpillars are seen, these at first living on the leaves, but later on spinning the axes of the umbels together, and eating up both the flowers and the fruit. In the years 1895–1900 especially, great damage was caused in certain districts by the caraway moth; since that period but little has been heard of it. Furthermore, a disease, which has not yet been identified, has of recent years caused considerable damage, especially to caraway which is more than a year old.

Harvesting.—As the fruits fall off easily, harvesting must be done carefully, a little early rather than too late. The plants are cut with small scythes or sickles or with mowing machines; in dry periods the cutting should be done early in the morning and late in the evening, and not in the hottest part of the day. The loose sheaves are at once built up in small stacks of from twenty to thirty sheaves, which are tied with string as a protection against the wind. After two or three weeks the stacks are ready for storage in the barn or for immediate thrashing. The latter operation often takes place in the field.

Yield, &c.—The yield varies considerably, frequently from 6 to 16 cwt. per acre. A harvest of from 14 to 16 bales of 50 kilograms (110 lb.) each per acre is considered good. On an average, however, not more than from 10 to 12 bales per acre are reckoned upon, and the average for the whole country is under 10 bales, being in 1909 exactly 9½ cwt. per acre. The seed is sold in bales of 50 kilograms (110 lb.),

principally to Germany, while the straw, 16 to 24 cwt. per acre, is used as cattle fodder or litter.

Caraway is an excellent crop in many respects. Harvesting takes place early, so that the stubble can be repeatedly ploughed and harrowed, and thus prepared for the next crop. After the caraway harvest, vetches are grown with success for the purpose of enriching the soil with nitrogen, and in some districts, *e.g.*, in West Friesland, various kinds of cattle fodder are grown. Prices, however, fluctuate greatly, and are sometimes very low, while in some years the caraway caterpillar does much damage. On this account caraway *should not be grown on too large a scale.* The price of the seed in 1910 was about 24*s.* per cwt., but afterwards fell to about 21*s.* 6*d.* per cwt.

The Use of Manures in Forestry.

AT the Sixth International Forestry Congress at Brussels a paper was presented by Dr. Schwappach, Professor of Forestry at Eberswalde, dealing with the manuring of forest trees, a question to which some attention has been devoted in Germany during recent years. Dr. Schwappach observed that manuring had not the same importance in forestry as in agriculture. The relatively small amount of mineral salts retained in timber, the long period of time which intervenes between the planting and the felling of a forest, the fact that trees during their growth give back to the soil the greater part of their mineral constituents by the fall of leaves and twigs, and, lastly, the decomposition of the soil which is constantly going on, all render unnecessary the replacement of mineral salts by artificial means. The old Continental forest soils, moreover, are usually sufficiently rich in mineral salts, and do not suffer from exhaustion under the present-day systems. In addition, artificial manuring causes a rise of 50 to 100 per cent. in the cost of planting, for which no return can in any case be obtained until the end of the rotation.

It is now twenty years since experiments in manuring were begun, first in Belgium and Holland, and afterwards in Germany. The results up to the present tend to show that

in the better types of soils the necessary food salts are present in sufficient quantity, and that artificial manuring is only of importance where the soil has deteriorated, or in cases where it is desired to carry a crop quickly over some critical period, such as danger from frost or game. Owing to the relatively deep position of the roots, manuring with ordinary manures is practically without result on middle-aged woods. The only possibility of encouraging the development of such woods seems to lie in bringing about the quicker decomposition of the fallen leaves and twigs, either by working the soil, or, better still, by the application of lime. The irrigation of a sixty-year-old pine wood at the Berlin Irrigation Works with sewage water was tried, but was a distinct failure, as a monthly application during the chief vegetation period of the year caused, in two years, the death of many stems. Considerably better results were obtained by irrigation experiments at Görlitz, where irrigated plantations of spruce, Weymouth pine, and Scotch pine showed a better growth than those not irrigated. In this case, however, the woods treated were, at the most, thirty years old, and the importance of age seems to be shown by the fact that at the Berlin Irrigation Works new plantations on irrigated areas have shown good growth. A form of manuring in pine woods which offers prospects of success is the covering of the soil with a layer up to 8 inches deep of city refuse. The City of Berlin has experimented in this direction, with the result that after two years the pine woods treated showed excellent development.

It is, however, in the planting and early growth of trees on poor soils that artificial manuring assumes importance. Soil analyses show that in poor, sandy soils the nitrogen contents have been reduced to a minimum, and consequently this element is the chief consideration; phosphoric acid also plays an important part, but potash is only of subordinate importance. As nitrate of soda and sulphate of ammonia are too rapid in their action for a slow-growing crop, the chief difficulty in manuring on sandy soils is to supply nitrogen in a slowly available form at the least cost. Up to the present, experiments indicate that this can best be done by utilising the nitrogen contained in plant residues in

one of the following ways:—(1) planting of leguminosæ, especially lupins and acacias, on sandy soil, and trefoil and grey alder on chalky soils; (2) dressings with turf and other substances containing humus; (3) covering the soil with lupin-haulm, potato tops, straw, leaves, and small twigs; and (4) interplanting with a species having a heavy leaf fall, such as *Pinus rigida* and *Pinus montana*. Lupins, which in many cases have proved of great value, can be used in one of two forms, either as a crop before the trees are planted, or between the lines of trees. For the first purpose, the yellow lupin, and for the second the blue lupin, is best suited. When the whole area is cropped before planting trees, a dressing of about $3\frac{1}{4}$ cwt. to $6\frac{1}{2}$ cwt. of basic slag and $1\frac{3}{4}$ cwt. to $3\frac{1}{4}$ cwt. of kainit per acre should be used. In addition inoculation with nitragin may be recommended, although lupins generally grow well, even on poor heath lands, and on soils which have not carried a leguminous crop. If the lupins develop poorly in the first year, they must be sown again the second year. It is necessary in every case to get a good crop of lupins before planting. The cost of raising a crop of lupins is said to be about £1 12*s*. per acre in Germany, but in Belgium an intermediate crop of rye or oats is taken in order to reduce the cost. The fact that phosphoric acid and nitrogen are removed by rye and oats is not sufficient to prevent an appreciable enrichment of the soil in these substances. In Germany, experiments are being made to test the effect of substituting potatoes for rye as an intermediate crop. This method has the advantage that the soil is worked up in digging the potatoes, and the tops are left on the ground.

A cheap system is to interplant with blue lupins. By this method the area is ploughed up in the late autumn in the usual way, and during the winter manured in the drills with basic slag and kainit. The pines are planted the next spring. In this way only 25 to 30 per cent. of the area is manured. In favourable seasons excellent results are obtained. On chalky heathland, the place of the lupin can best be taken by *Trifolium hybridum*, grown between the forest trees.

There are also a number of trees which possess the property of utilising the free nitrogen of the air, and making it avail-

able, not only for their own growth, but for that of species planted with it. In middle Europe the chief are the acacia and grey alder, the first on sandy soil, the second on chalky soil.

Applications of turf and other material containing humus, especially dried turf, have given very satisfactory results under unfavourable conditions. By this method pines are either planted in pits, which are filled up with a mixture of humus and sand, or these materials are placed in trenches between the trees of the existing crop. In the first case covering with small twigs, lupin haulm, potato tops, and similar waste material works well in the first year. Another method of manuring is to mix with the pine those species which shed a large quantity of needles, such as *Pinus rigida* and *Pinus montana*. About the tenth year the common pine should overtake and suppress the species mixed with it, but by this time the canopy should be complete.

The use of other nitrogenous manures, such as nitrate of soda, &c., is, in ordinary circumstances, out of the question, but their use may sometimes be justified on plantations five to ten years old which for some reason or other are not growing well. Such an application of nitrogenous manures causes an excessive growth of weeds, which necessitate considerable attention to the young crop.

Isle of Wight Bee Disease.*

For some years past an epidemic disease has attacked bees in the *Isle* of Wight, and has since reached the mainland, where it appears to be spreading. The epidemic has been under investigation for some time by the Board of Agriculture and Fisheries, but though a good deal of information has been accumulated and some progress made with the study of the disease, it is not yet possible to say definitely what is the originating cause of the disease, or how it may be checked, or even prevented. The investigation, however, is being continued, and it is hoped that eventually a remedy will be found.

In the meantime, it is important that bee-keepers should

* This note is now being issued as a leaflet (No. 253), and copies may be obtained on application to the Secretary, Board of Agriculture and Fisheries, Whitehall Place, London, S.W.

watch their bees, and on the appearance of the symptoms described below proceed to—

(1) Destroy the diseased colonies, and all combs, stores, and quilts.

(2) Paint the hive and all woodwork twice at intervals of 24 hours with a solution of 1 part strong carbolic acid and 2 parts hot water, and then expose the inside of the hive to light and air for several days. Alternatively the surface of the woodwork may be burnt by means of a painter's spirit lamp.

(3) Collect and burn the dead bees found on the ground. The ground should then be sprayed with some strong disinfectant, such as 8 oz. carbolic acid to a gallon of water; or it may be covered with quicklime.

Symptoms.

1. The first symptom usually noticed is a disinclination of the bees to work. They fly about aimlessly and do not gather stores.

2. A little later they lose their power of flight, and are unable to travel more than a few yards without alighting.

3. As the disease progresses the bees are only able to fly a few feet, when they drop and crawl about the ground. They may be seen crawling up grass stems or other upright objects such as the supports of the hive, but they soon fall down and die. Towards night some may be seen gathered in groups, but these usually die before morning.

4. The abdomen or hinder part of the body is often swollen, and the extreme segments or rings droop and are bent underneath the rest of the body.

5. The wings often appear to be disconnected, the upper wings lying flat above the body, while the lower wings stand out from the body as in flight. Sometimes the legs seem affected, and the bees stagger along in their attempts to walk.

6. Finally the whole colony of workers is found massed together in front of the hive or on the ground, except a few which are found crowded round the queen.

7. The foragers are always the first affected. The queen and the brood are not attacked, though "chilled brood" often appears subsequently, owing to there being insufficient bees to keep the hive warm.

8. In winter and early spring, when bees are often attacked, the walls, combs, and alighting board are frequently soiled by the bees. This seldom if ever takes place in the summer.

Although it is not certain what is the direct cause of this disease it can be distinguished from some of the other diseases to which bees are liable. Thus, in cases of Bee Paralysis, the hinder part (abdomen) of the bees is discoloured and blackish. The bees tremble and the wings are bent up in a way that is not the same as the distortion visible in Isle of Wight Disease. In cases of "May Pest" both young and old bees are affected, and their bodies are covered with a light grey dust. In cases of Dysentery the bees soil the combs as in Isle of Wight Disease, but the droppings are dark and muddy, and not of the yellow colour that is usual in the present disease. A course of treatment for all these diseases is given in the text-books on bee-keeping.

SUMMARY OF AGRICULTURAL EXPERIMENTS.*

FIELD CROPS.

Seed Potatoes of Different Sizes (*Field Expts. in Staffs and Salop and at Harper Adams Agric. Coll., Joint Report,* 1910).—The opinion is held by some growers that in the case of Langworthy and potatoes of a similar type large sets should be used, and that though this is a kidney potato and therefore does not sprout freely, it is preferable to cut ware rather than plant seed size. In order to test the point, Langworthy potatoes of the following sizes were obtained from Scotland:—(1) Seed size, between 1¼ and 1½ inch riddles; (2) large ware size, over 2¼ inch riddles; (3) ware size, between 1½ and 2 inch riddles.

The manner in which the seed was planted and the crops which were obtained were as follows:—

	Weight of seed per acre. lb.	Crop of ware per acre. tons	cwt.
Seed size	1,200	8	4
Large ware (cut)	3,360	10	12
Ware (cut)	1,440	10	19
Ware (whole)	3,040	10	1

It will be seen that the best result was obtained, both in yield per acre and in return per lb. of seed planted, by cut ware at the rate of 1,440 lb. per acre.

* A summary of all reports on agricultural experiments and investigations recently received will be given each month. The Board are anxious to obtain for inclusion copies of reports on inquiries, whether carried out by agricultural colleges, societies, or private persons.

Correlation between the Number of Eyes in Seed Potatoes and the Yield (*Deutsche Landw. Presse, February 8th,* 1911).—Tests carried out with four varieties of potatoes at the Agricultural Station at Ope, in Sweden, in 1908, appeared to show the existence of some definite connection between the number of eyes in the "sets" and the yield.

Further experiments were undertaken in 1909 and 1910 at three Swedish Experiment Stations. As a rule the number of eyes can be taken as proportional to the size of the tuber, but in these trials tubers of the same size, but with different numbers of eyes, were chosen as far as possible. It was again established that the number of eyes in the sets has an influence on the yield, both the weight and number of the tubers increasing with the number of eyes. The following were some results obtained :—

Variety.	No. of eyes.	Yield from 10 sets.	
		Weight.	No. of tubers.
		lb.	
White "Jemtland"	4·0	8 6	156
,, ,, ...	10·2	13 8	244
"Mandel"...............	3·6	5·3	127
,, ...	10·1	10·8	270
—	5.0	—	98
—	9·5	—	177
		Yield from 25 sets.	
Red "Jemtland".........	8·2	21·4	287
,, ,, ...	12·6	30 6	497

It is suggested that the productivity of a variety can be raised by making use of these results, since it was found that the characteristic of a large number of eyes in the sets was transmitted to the crop of tubers obtained; *e.g.*, the following relation between the number of eyes in the sets and in the tubers yielded was obtained in 1909 :—

Number of eyes in sets.	Number of eyes in potatoes harvested.		
	Large tubers.	Average.	Small.
6·4	9·8	6·6	6·8
12·4	13·0	9·9	7·7

Varieties of Cereals and Thick and Thin Seeding of Oats (*Field Expts. in Staffs and Salop and at Harper Adams Agric. Coll., Joint Rept.,* 1910).—Sixteen varieties of wheat were tried in 1910 on a good loam soil previously under seeds, which had been dressed with 8 tons of farmyard manure in July, 1909. The yields exceeded those of any previous year, and all the crops were harvested in good order. There were no great differences between the yields of the English wheats, but Browick Grey Chaff again gave the largest yield (54 bush. per acre), and the most profitable return per acre for grain and straw. The next in order were Regenerated Squarehead, Victor, and White Wheat, all

of which gave 52 bush. per acre, the last, however, being sprouty, was valued at 2*s.* per bushel less than the first two. Home seed of two French varieties was sown, and they yielded as follows:—Sensation, 42 bush. per acre; Marvel, 39 bush. per acre. In 1909 the yields of these two from French seed were 36 and 41 bush. respectively. The highest quality wheat grown was J.08, a selection from Red Fife, which was valued at 34*s.* per bush., with a yield of 42 bush. Fife (Home seed) was valued at 33*s.* 3*d.* per bushel, and gave 45 bush. per acre. This was sown at the rate of 240 lb. per acre instead of 150 lb., as in the case of the other varieties.

Ten varieties of oats were grown after mangolds on a somewhat heavy loam in fair condition. They were manured with 2½ cwt. dissolved bones and ½ cwt. calcium cyanamide per acre. The yields of oats also exceeded those of any previous year. The best result, 98½ bush. per acre, was given by Thousand Dollar, which has consistently shown good results on the College farm. New Abundance and New White Horse both gave 92½ bush., and a new variety, Garton's 2209, gave 94½ bush. This sort looked remarkably well throughout the season, and appeared to promise the best crop. On the whole it stood up better at harvest than Thousand Dollar and Abundance. The weight of this variety was, however, only 39½ lb. per bushel, as compared with 43 to 45 lb. in the case of the three other varieties named.

A trial was made to test the comparative advantages of thick and thin seeding of oats. A correspondent was of opinion that a thickly-seeded crop on rich land is less likely to lodge, and further that with thick seeding the crop starts better, while rank growth and lodged grain is checked by the thickness of the plants. Plots were sown at the rates of 280, 240, 200, and 160 lb. per acre, the usual rate of sowing at the College farm being 200 lb. per acre. The yields did not vary very greatly, being 94½, 91¼, 92½, and 86¼ bush. (of 39 lb.) respectively per acre. After deducting the cost of the seed the net return was greatest with sowing at 200 lb. per acre, though, as will be seen, the heavier sowing gave the largest yield. Very little difference was to be seen in the appearance of the plots before harvest, and on all plots patches were laid, there being practically no difference in this respect.

Varieties of Mangolds and Swedes (*Field Expts. in Staffs and Salop and at Harper Adams Agric. Coll., Joint Report,* 1910).—A comparison of fourteen varieties of mangolds was made in 1910. The best yields were as follows:—Sutton's Prizewinner Yellow Globe, 45 tons per acre; Leighton's Timmis, 44 tons 5 cwt.; Garton's Red Globe, 43 tons 11 cwt.; Dickson and Robinson's Defiance, 41 tons 18 cwt.; Hayward's Challenge, 41 tons 18 cwt. Four varieties have been grown for five or six years, and the following are the average yields given by them:—Dickson and Robinson's Eclipse Red, 43 tons 16 cwt.; Sutton's Prizewinner Yellow Globe, 42 tons 10 cwt.; Sutton's Golden Tankard, 33 tons 8 cwt.; Garton's Improved Yellow, 31 tons 4 cwt.

Twelve varieties of swedes were tried. There was little difference between the yields of most of them, the three first being:—Incomparable, 22 tons 6 cwt. per acre; Keepwell (Garton), 22 tons 3 cwt.; and Nimrod (Dickson and Robinson), 21 tons 16 cwt.

Seeding of Temporary Ley (*Field Expts. in Staffs and Salop and at Harper Adams Agric. Coll.; Joint Report,* 1910).—The following trial

has now been carried on over three seasons with the object of ascertaining the amount of seed it is economical to use for a one year's ley. The plots in each trial were seeded down in the barley crop of the preceding year, and the produce of the plots was cut and made into hay before weighing. The mixtures consisted of Italian Rye Grass, Red Clover, Alsike, and Trefoil, and in some of them Cow Grass, Perennial Rye Grass, and White Clover were added. The amount and cost of the seed used and the resulting crops are shown below :—

Weight of seed per acre.	Cost of seed per acre.		Average crop.	
lb.	s.	d.	tons	cwt.
15	10	7	2	7
22½	14	7	2	5
35¼	20	4	2	5
17	12	0	2	7

The heavy seedings have thus not given so good a return as the lighter seedings. Very little difference could be seen in the appearance of the plots after cutting.

LIVE STOCK, POULTRY, AND FEEDING STUFFS.

The Feeding Value of Different Varieties of Mangolds (*Jour. Agric. Science, Vol. iii., Pt. 3, September,* 1910).—An investigation into the chemical composition of mangolds, which was begun in 1903 at Cambridge University, showed that the Long Red mangold, owing to its high yield and percentage of dry matter, produces about 20 per cent. more dry food per acre than any other variety. At the same time a series of feeding experiments was started in order to discover whether this superiority of the Long Red over the Globes and Tankards would be borne out in practical farming, that is to say, whether the feeding value of any type of mangold is proportional to its percentage of dry matter. The chemical investigation and the earlier feeding trials were noticed in the *Journal* for October, 1908, p. 538, but this paper contains a complete summary by Prof. T. B. Wood of the whole investigation which has been carried out by him since 1907.

The points tested were the comparative feeding value of Yellow Globe and Long Red mangolds as constituents of a liberal fattening diet, the comparative feeding value of Golden Tankard and Long Red mangolds, also in a fattening diet, and the comparative feeding value of Yellow Globe and Long Red mangolds for store cattle. Every precaution was taken to choose for the experiment animals of uniform weight and capacity for growth, but, in spite of this, it was found that in a single trial the variation among the individual animals receiving the same treatment was far greater than the quantity the experiment sought to measure, and Prof. Wood remarks that little reliance can be placed on the results of single experiments with the small number of animals commonly employed in feeding tests. The results of all the trials are discussed according to the methods used in the theory of probabilities in order to find which of the results obtained were really significant of some difference in the feeding value of the mangolds, and not due to variations in the capacity of the animals for improvement, and the following conclusions are arrived at:—

From seven trials on fattening cattle with Long Red and Yellow Globes, the relative feeding values of the two types are approximately as 116 to 100 in favour of Long Red. This agrees as well as can be expected with the relative percentages of dry matter, which are as 120 to 100 in favour of Long Red.

Two comparisons of Long Red and Golden Tankard indicated that there is no appreciable difference in the feeding value of these types. This also agrees with the fact that their percentages of dry matter are practically equal. The three experiments with store cattle were regarded as inconclusive.

Autumn Chicken Rearing (*Field Expts. in Staffs and Salop and at Harper Adams Agric. Coll., Joint Report,* 1910).—The objects of this experiment were to find the cost of rearing autumn-hatched chickens to a killing age, and to note the rate of increase in weight week by week for food consumed. The cost of spring rearing is to be determined in the spring of 1911 in order to compare it with autumn rearing. Thirty-one eggs were put in the incubator on September 30th, of which 21 were fertile and 17 hatched. One chick was accidentally killed. The trial extended over eighteen weeks. For the first fortnight the chicks were fed on a dry mixture containing no meat, which cost 12*s.* per cwt. From the second to the sixth week they were fed on a mixture containing meat at a cost of 24*s.* per cwt. From the sixth to the sixteenth week they received the same mixture as at first at a cost of 12*s.* per cwt. During the last two weeks of this time they were given a midday soft feed of 2 parts fine oatmeal and 3 parts wheat meal mixed with separated milk. For the last two weeks of the trial the soft food was given twice a day, and consisted of 2 parts fine oatmeal, 3 parts wheat meal, and 2 parts maize meal mixed with separated milk, while the evening feed was changed to whole barley.

At the end of the 18 weeks the average weight of the chickens was 3 lb. 12½ oz., and the food consumed by each was 14 lb. 9 oz. The cost and returns worked out as follows:—

	s.	*d.*
Cost of thirty-one eggs	5	2
Cost of oil for incubator and brooder	1	1
Cost of grain and meal	25	5½
Total cost of rearing sixteen chickens	31	8½
	s.	*d.*
Average cost per chicken	2	0
Market value per chicken	3	0

DAIRYING.

Use of Molasses as a Condiment in Food and its Effect on Milk Secretion (*Die Landw. Versuchs-Stationen, Band lxxiv., Heft iii.–v.*).—This publication reports some experiments conducted by Herr Gustav Fingerling, of the Hohenheim Agricultural Experiment Station, as to the influence of condiments on milk secretion, in continuation of those noticed in this *Journal* for September, 1905, Vol. xii., p. 367. The experiments were carried out with three goats, and consisted in ... oods composed of

meadow hay, sesame cake, brewers' grains, starch flour, and salt, with a specially compounded ration containing the same amount of food material, but in unappetising forms, viz., straw, gluten, and earth-nut oil, and then testing the effect of the addition of molasses to this latter ration.

The addition of molasses to the feeding stuffs poor in condimentary matter was found to raise the milk production by almost one-half as much again, the yield obtained being, in fact, practically identical with that obtained from the foods rich in condimentary stuffs (hay, brewers' grains, &c.). It is suggested, therefore, that the agriculturist possesses in molasses a means of making tasteless or unsavoury food more acceptable to animals. Molasses contains materials which, apart from their content of digestible foods, have a considerable influence on milk secretion. The poorer the fundamental rations in sweet tasting or sweet smelling materials, the more marked was the effect of the addition of molasses.

Experiments on feeding molasses to dairy cows were also noticed in this *Journal*, June, 1901, Vol. viii., p. 45.

Influence of Foods on the Composition of Milk Fat (*Die Landw. Versuchs-Stationen. Band* lxxiv., *Heft* iii.–v.).—In continuation of the foregoing experiment, the influence on milk fat of the feeding stuffs given to cows was investigated. Roots, potatoes, and lucerne were compared with dry foods as before. The milk was left to stand for twenty-four hours, when the cream was taken off and made into butter. From the butter fat obtained were determined the saponification number, the Reichert-Meissl number, and the iodine number, then the refractive index and the melting-point. The following conclusions were drawn from the experiment:—Feeding with foods the fat of which has a high iodine number (*e.g.*, maize, barley, bran, and rape seed cake) raises the iodine number but lowers the Köttsdorf and Reichert-Meissl numbers. Compared with concentrated foods such as maize and rape seed cake, roots and potatoes increase the content of volatile fatty acids in the milk fat. Although the fat in the foods influences the composition of the milk fat, rations composed of quite different feeding stuffs can produce the same amount of milk fat. Towards the end of lactation the saponification and Reichert-Meissl numbers of the milk fat are lowered, while there is a rise in the iodine number, the refractive index and the melting-point. After a change in feeding (*e.g.*, from watery to dry foods) the saponification and iodine numbers of the milk fat are quicker to change than the Reichert-Meissl number.

An Organism producing a Burnt-milk Taste (*Centralblatt für Bakteriologie, &c., Abt. II., Bd.* 29, *Heft* 1–3).—This journal contains an interesting note on a new organism which has been isolated by Mr. Wilfrid Sadler, Assistant Instructor in Dairying and Dairy Bacteriology at the Midland Agricultural College, Kingston. In the autumn of 1909 the College received a sample of milk possessing a peculiar flavour and aroma. The milk was soured, and had an aroma resembling caramel, while the taste or flavour was similar to that of milk which had been cooked or burnt; further, the flavour was distinctly bitter, the milk thus being totally unfit for consumption.

Quantities of sterile milk were inoculated and submitted to fermentation tests, and were found to possess the same unmistakable properties as were exhibited by the original sample. Experiments of this nature were repeated with various milks, fresh, pasteurised, and sterilised, until it became evident that the trouble was a bacterial one. The adoption of the usual methods for the isolation in pure culture of bacteria resulted in the discovery of the organism, which is of the general type of Leichmann's *Bacterium lactis acidi,* and which, on inoculation into the milk, first produces the distinctive aroma referred to, and later brings about coagulation.

In the spring of last year the same trouble arose in the milk bought by the College for manipulation in the dairy, and since that time its occurrence has been intermittent. This intermittent nature of its recurrence has been one of the most prominent features observed during the investigation, particularly during the early part of the year. The contamination has been traced to a particular farm, but as yet the actual source of the organism has not been definitely determined. Mr. Sadler purposes to continue his investigations during the present year.

While the effect of this organism on milk intended for consumption as such is well-nigh disastrous, the result of its action on butter and cheese is very marked, and without doubt it might be the cause of much loss if it should arise in the dairy. Butter and cheese made from milk inoculated with a culture of the organism were found to have the characteristic flavour and aroma, and were both unpalatable and unsaleable. Butter was also made from the cream inoculated with a good lactic acid starter and a culture of the organism. In this experiment the flavour and aroma were sufficiently evident to prove that butter made from cream thus contaminated would have a poor market value, even when a good starter is added with a view to overcome the taint.

Milking-Machine Experiments in Belgium (*Revue Générale Agronomique,* December, 1910).—Trials have been made at the Zootechnical Institute of the University of Louvain of the "Alfa-Dalen" milking-machine. With a view to determining whether milking by the machine was more thorough than by hand, experiments were carried out in which four cows were milked by hand for ten days and by machine for the succeeding sixteen days. In each case three milkings were made per day, and the amount of milk left in the udder determined immediately after milking, by means of a supplementary milking. With two cows the machine gave better results, and with the other two cows hand milking was more thorough. The results, on the whole, however, were in favour of the machine, whether the absolute amount of milk left in the udder be considered, or the ratio of this amount to the amount actually obtained. The milk left in the udder per cow per day, after mechanical milking, was 0·50 pint as compared with 0·59 pint after hand-milking. A longer time was taken to empty the udder by machine than by hand, a fact which might have had some influence on the yield. Though the amount of milk obtained from the first morning's milking (6.15 a.m.) was in the case of both methods almost double that obtained at either of the two

subsequent milkings, it was noticeable that there was no appreciable difference in the amount left unmilked at the three milkings.

To ascertain the influence of the machine on the total milk production, the four cows were milked solely by machine for four and a half months. The amount of milk per cow per day obtained during the two experimental periods was 9·992 kilog. in the case of hand milking, and 10·920 kilog. in the case of mechanical milking. The cows which were milked by machine gave therefore a higher yield by about 2 lb. Apart from the small number of cows used, the comparison is unequal owing to the fact that the machine milking was continue for 4½ months, while the hand milking with which the results are compared extended over ten days only.

WEEDS AND INSECT AND FUNGUS PESTS.

Destruction of Thistles (*Field Expts. in Staffs and Salop and at Harper Adams Agric. Coll., Joint Report*, 1910).—These experiments were continued in 1910, and the conclusions stated in the *Journal*, March, 1911, p. 1,019, were confirmed.

At the request of the Board of Agriculture a special tool was tried on an additional plot. The tool resembled a much elongated pair of pliers, the object being to grip the plant and pull up a length of root. A comparison was made between the time taken in using the tool and cutting with a scythe. With careful use with this tool thistles could be pulled out with as much as 4 inches of underground stem attached, but in dry weather the plants broke off close to the surface, leaving the underground stems to form fresh shoots. The implement was tedious to use, and only a small area could be covered in a day. The cost worked out as follows:—"Plot A," with special tool.—One acre required 10 days' labour at 2*s.* 8*d.* per day, equalling £1 6*s.* 8*d.* per acre. "Plot B," cutting with scythe.—1½ acres were cut per day, with labour at 2*s.* 8*d.* per day, equalling 1*s.* 9*d.* per acre. The effect of the treatment on these two new plots was not noticeable the first season, but will be recorded in 1911.

Internal Disease and Sprain (Streak Disease) in Potato (*Jour. Agric. Science, Vol. III., Pt. 3, September*, 1910).—In this paper Mr. A. S. Horne, B.Sc., describes the symptoms of these two diseases, which at present appear to be distinct. It has been stated that if tubers affected with them are planted a healthy crop will nevertheless result. Experiments to test this point were made, and it was found in the case of both internal disease and streak disease that when diseased sets were planted a certain proportion of the tubers produced were affected. The question of whether the diseases spread during storage was also examined. Tubers were cut in half, and some sprinkled with lime and some not. Under these conditions the diseases did not appear to increase in the affected tubers or to spread to others, but the question was complicated by attacks of other diseases.

A Bacterial Disease of Swedes (*Jour. of Agric. Science, Vol. iii., Pt. 4, December*, 1910).—This is a report of an investigation carried

out at Bristol University by Messrs. J. H. Priestley and A. E. Lechmere. Specimens of swedes attacked by this disease were sent from the neighbourhood of Taunton to the University of Bristol. The first indication of attack was described as being the appearance of a small crack on the side of the root, almost as if made by a hoe; this crack gradually widened, the interior being filled with slimy, rotting tissue, and in many cases the plant died. By infecting pieces of fresh swede and turnip with slime from a diseased root, the decay was shown to be due to bacterial action and not to an injury alone. Several organisms were isolated, and the one to which the disease is attributed is considered to be probably *Bacillus oleraceae* (Harrison), the cause of soft black rot of cabbages, but also closely allied to *Pseudomonus destructans* (Potter), which causes soft white rot in turnips, &c. It is suggested, after consideration of its appearance on various culture media, that these two organisms may be different growth forms of the same parasitic species.

The cultures show that the organism is capable of existence as a saprophyte, and this means that it may continue to exist in the soil, on rotting tissue, long after the crop itself has been removed. This makes the question of the extermination of the disease a difficult one; one obvious precaution is to lengthen the period as far as possible between successive crops of the turnip and cabbage kind when the disease has once appeared. It seems capable of growing in both an alkaline and an acid medium, so that it does not seem clear that any particular dressing applied to the soil would affect its increase. In this particular case of infection the disease was prevalent at the same time, and under the same conditions, as finger-and-toe, which would indicate insufficient lime in the soil. The practical question of the treatment of the soil would, however, need to be investigated by field experiments.

Wart Disease of Potatoes (*Wart Disease of Potatoes, Harper Adams Agric. Coll.*, 1910).—These experiments are included among those on which a report appeared in the *Journal*, April, 1911, p. 42. The present bulletin contains the results of inquiries as to the method of infection and of the spread of the disease, and details of the experiments carried on at the Harper Adams College in 1909 and 1910 to discover resistant varieties of potatoes, and a means of checking the disease by fungicides. The yields of all the varieties resistant to the disease that have been grown are shown. The fungicide dressings that were tried consisted of quicklime, gas lime, sulphur, salt, soot, copper sulphate, sodium borate, potassium sulphide, black sulphur, ferrous sulphate, strawsonite, and a proprietary Black Scab Compound. None of them was found to be of any value.

OFFICIAL NOTICES AND CIRCULARS.

County Committees for the Encouragement of the Horse-breeding Industry.

The President of the Board of Agriculture and Fisheries is appointing Committees in each county for the purpose of assisting the Board in all matters pertaining to the encouragement and improvement of the horse-breeding industry. The members of these committees are nominated by the Chairmen and Conveners of the County Councils, and are gentlemen having an intimate acquaintance with the industry of horse-breeding, and with their assistance and co-operation the Board hope to ascertain in the fullest manner all necessary details as to the character and extent of the industry in the localities which they represent.

The names and addresses of the gentlemen forming the Committees in the following counties were given in last month's *Journal* (p. 58):—Cumberland, Gloucester, Hereford, Isle of Wight, Northampton, Rutland, Salop, E. Sussex, W. Sussex, Staffs, Westmorland, Worcester, Yorks (E. R.), Brecknock, Carmarthen, Denbigh, Monmouth, Radnor, Argyll, Bute, Dumbarton, and Renfrew. Committees have also been appointed for the following counties:—

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Henry Parry, Glanrafon, Pontrug, Carnarvon.
G. Cornelius Roberts, Maes, Pwllheli.
Secretary, R. W. Pritchard, Coed-Marion, Carnarvon.

Flint.

Hon. E. Mostyn, Mostyn Hall, Mostyn, Flint.
Captain Blackburn, D.S.O., Tyddyn, Mold.
Major T. M. Keene, Mold.
W. R. K. Mainwaring, Hartsheath, Mold.
Hugh Peel, Brynypys, Ellesmere, Salop.
William Thompson, Celyn Farm, Leeswood, Mold.
Secretary, Major T. M. Keene, Mold.

Merioneth.

Robt. Evans, Crynierth, Llandderfel, Corwen.
J. M. Jones, Caergai, Bala, Merioneth.
R. N. Jones, Brynmelyn, Corwen.
John Owen, Rhosigor, Talsarnau, Merioneth.
Robt. Roberts, Rhydygarnedd, Towyn, Merioneth.
Secretary, R. N. Jones, Brynmelyn, Corwen.

Montgomery.

W. Forrester Addie, Estate Offices, Powis Castle, Welshpool.
David Davies, M.P., Llandinam Hall, Llandinam.
Wm. M. Dugdale, Llwyn, Llanfyllin, Mont.
E. Green, The Manor, Welshpool.

T. Green, The Bank, Pool Quay, Welshpool.
E. Hughes, Mathafarn, Machynlleth.
Hugh Lewis, Glan Hafren, near Newtown.
R. Morgan, Snowfield, Kerry, Newtown.
Major Mytton, Shawbury, Shropshire.
Secretary, Ernest C. Morgan, Crown Chambers, Newtown.

Pembroke.

The Lord Kensington, St. Bride's, Little Haven, R.S.O., S. Wales.
George Bevan Bowen, Llwyngwair, Newport, S.O., Pembroke.
John Gibbon, Vaynor, Narberth, Pembroke.
T. George Phelps, Cresselly, Begelly, Pembroke.
John Frederick Lort Phillips, Lawrenny, Begelly, Pembroke.
W. P. Roch, Plas-y-Bridell, Cilgerran, Pembroke.
John Walters, Southwood, Roch, S.O., Pembroke.
Colonel O. H. S. Williams, Cleddau, near Haverfordwest.
Secretary, R. H. B. Summers, Summerville House, Haverfordwest.

Aberdeen.

The Earl of Erroll, Barwell, Chessington, Surrey.
The Lord Saltoun, 3 Hereford Gardens, London, W.
The Lord Sempill, Fintray House, Fintray, Aberdeenshire.
W. Aitchison, Coniecleugh, Huntly.
G. Anderson, West Fingask, Old Meldrum, Aberdeenshire.
G. F. Barron, Thomastown, Auchterless, Aberdeenshire.
Baillie Booth, Downiehills, Peterhead.
A. T. Gordon, Freefield, Insch, Aberdeenshire.
Colonel King, Tertowie House, Aberdeenshire.
Secretary, J. E. Macqueen, 34 Bridge Street, Aberdeen.

Ayr.

Lieut.-Colonel Hamilton Campbell, Greystones, Ayr.
J. A. Campbell, Craigie House, Ayr.
W. T. R. Houldsworth, Kirkbride, Maybole, Ayrshire.
W. McLanachan, Borland, Cumnock, Ayrshire.
David Muir, Buistonhead, Kilmans, Ayr.
R. A. Oswald, Auchincruive, Ayr.
J. H. Turner, Portland Estate Office, Kilmarnock.
Secretary, James Shaw, County Buildings, Ayr.

Banff.

A. Brodie, Blackpots Tile Works, Banff.
Alexander Forbes, Rettie, Boyndie, Whitehills, Banff.
Thomas Gordon-Duff, Drummuir, Keith.
James Grant, Tomnavoulin, Glenlivet, Ballindalloch, Banffshire.
Thomas P. Horsfall, Braco, near Keith.
Arthur McKilligin, Midtown of Haddo, Forgue, Huntly.
Captain G. A. Wilson, The Haughs, Keith.
Secretary, George Donald, Ladyhill, Keith, Banffshire.

Berwicks.

The Lord Dunglass, Springhill, Coldstream.
Sir John Home-Purves-Hume Campbell, Bart., Marchmont, Duns.
T. Calder, Swinton Hill, Coldstream.
George Dove, Whitehouse, St. Boswell's, Newtown St. Boswell's, Roxburghshire.

J. Fulton, Hatchednize, Coldstream.
J. L. Greig, Eccles, Kelso.
Major J. Hunter, *Anton's Hill, Coldstream.*
Lieut.-Colonel W. Murray Threipland, Dryburgh Abbey, St. Boswell's, Newton St. Boswell's, Roxburghshire.
Major R. D. Sinclair Wemyss, Wedderburn Castle, Duns.
Secretary, J. Fulton, Hatchednize, Coldstream.

Caithness.

Alexander Clyne, Tister House, Halkirk, Caithness.
Alexander Gunn, Ochalone, Halkirk, Caithness.
A. W. Henderson, Bilbster House, Wick.
D. P. Henderson, Stemster House, Halkirk Roadside, Halkirk, Caithness.
Dr. J. R. Kennedy, Dunheath, Caithness.
George King, Berriedale, Caithness.
William Smith, Forss, Thurso.
Secretary, James Young, County Clerk's Office, Thurso.

Clackmannan.

John Ernest Kerr, Harviestoun, Dollar, N.B.
D. A. Kinross, Hillend, Clackmannan.
Captain James Younger, Beechwood, Tillicoultry.
Secretary, J. W. Moir, County Buildings, Alloa.

Dumfries.

Lewis Beattie, Mossknowe, Canonbie, Dumfriesshire.
Charles Brook, Kinmount, Annan.
W. L. Carlyle, Templehill, Ecclefechan.
Major Carruthers, Dormont, Lockerbie.
P. A. Johnson-Ferguson, Knockhill, Ecclefechan.
H. C. Irving, Burfoot, Ecclefechan.
J. Stewart Lyon, Jessfield, Amisfield, Dumfries.
J. J. Paterson, Terrona, Langholm.
C. W. Ralston, Dabton, Thornhill.
Secretary, Major H. Hall, Denbie, Lockerbie.

Fife.

The Earl of Rothes, Leslie House, Fife.
Lord Ninian Crichton Stuart, House of Falkland, Falkland, Fife.
T. H. Erskine, Grangemuir, Pittenweem, Fife.
Captain John Gilmour, M.P., 1 Culford Gardens, London, S.W.
J. Millar, Waulkmill, Charlestown, Dunfermline.
G. Russell, Hatton, Lundin Links, Fife.
Secretary, F. W. Christie, Castlefield, Cupar.

Forfar.

James Carmichael, Atherstone, Meigle, Perthshire.
A. F. Durkie, M.R.C.V.S., Mill of Mains, Dundee.
Captain Hugh Annesley, Gray-Cheape, Carse Gray, near Forfar.
Herbert K. Ogilvy, W.S., Auchterhouse, Forfarshire.
Gavin Ralston, Glamis, Forfar.
W. Addison Scott, Newton of Arbirlot, Arbroath.
Provost Stewart, Chellwood, Monifieth, Dundee.

Inverness.

The Mackintosh of Mackintosh, Moy Hall, Inverness.
The Lord Lovat, K.C.V.O., C.B., D.S.O., Beaufort Castle, Beauly, Inverness.
J. E. B. Baillie, M.V.O., Dochfour, Inverness.
Major Fraser-Tytler, Aldowrie Castle, Inverness.
Colonel A. W. McDonald, D.S.O., Blarour, Spean Bridge, Inverness.
J. A. R. Macdonald, Balranald, Lochmaddy, North Uist.
Major K. L. Macdonald, Skeabost, Isle of Skye.
Nicol Martin, Glendale, Skye.
Secretary, Duncan Shaw, County Clerk's and Treasurer's Office, Inverness.

Lanark.

Sir S. Macdonald Lockhart, Bart., M.V.O., The Lee, Lanark.
J. P. Baird, Castlemains, Douglas, Lanarkshire.
Charles M. Douglas, Auchlochan, Lesmahagow, Lanarkshire.
Richard Dunn, Udston, Hamilton.
Archibald M'Lean, Midtown of Blackwood, Lesmahagow, Lanarkshire.
Alexander Murdoch, East Hallside, Newton, Lanarkshire.
John Murray, Park Hall, Douglas, Lanarkshire.
T. Purdie Somerville, Sandilands, Lanark.
Colonel King-Stewart, Murdostoun, Newmains, Lanarkshire.
Wm. Templeton, Torland, Netherburn, Lanarkshire.
James C. Hope Vere, Blackwood, Kirkmuirhill, Lanarkshire.
Secretary, George Findlater, Jerviswood Mains, Lanark.

Kincardine.

Sir Thomas Burnett, Bart., Crathes Castle, Crathes, Aberdeen.
James Alexander, Bent, Laurencekirk, Kincardineshire.
George T. Brown, East Cairnbeg, Fordoun, Kincardineshire.
Colonel J. Davidson, Balnagask, Aberdeen.
W. G. Falconer, Cairnton, Fordoun, Kincardineshire.
Sydney J. Gammell, Countesswells House, Bieldside, Aberdeen.
George Milne, Mains of Barras, Stonehaven.
Secretary, George T. Brown, East Cairnbeg, Fordoun, Kincardineshire.

Kirkcudbright.

Major A. Brown, County Buildings, Kirkcudbright.
C. E. Galbraith, Terreglas, Dumfries.
Major C. G. Graham Hutchison, Balmaghie, Castle Douglas.
Major John McKie, D.S.O., Ernespie, Castle Douglas.
W. J. Herries Maxwell, Munches, Dalbeattie.
A. Mitchell, Lochfergus, Kirkcudbright.
C. A. Phillips, Dildawn, Castle Douglas.
Secretary, Major A. Brown, County Clerk, Kirkcudbright.

Midlothian and Linlithgow.

Colonel Gordon-Gilmour, C.B., M.V.O., The Inch, Liberton, Midlothian.
J. McHutchen Dobbie, Campend, Dalkeith, Midlothian.

Prof. James Cossar Ewart, M.D., F.R.S., F.Z.S., Craigybield, Penicuick, Midlothian.
James Fraser-Tytler, Woodhouselee, Roslin, N.B.
Enoch Glen, Glenavon, Bathgate, Scotland.
John T. McLaren, The Leuchold, Dalmeny Park, Edinburgh.
Seton M. Thomson, Preston House, Linlithgow.
Colonel R. G. Wardlaw-Ramsay, Whitehill, Rosewell, Midlothian.
Secretary, John Stewart, 3 Thistle Court, Edinburgh.

Nairn.

Alex. Clark, Blackparks, Nairn.
John Alexander Robertson, Royal Stables, Nairn.
J. S. Robertson, Cawdon Estate Office, Nairn.
Secretary, John Alexander Robertson, Royal Stables, Nairn.

Roxburgh and Selkirk.

The Right Hon. the Earl of Minto, K.G., &c., Minto, Hawick.
David Ballantyne, The Shaws, Newcastleton, Roxburghshire.
C. W. Grieve, Branxholm Park, Hawick, N.B.
Robert Henderson, Mount Hooly, Jedburgh.
T. Robert Scott, Lanton Tower, Jedburgh.
Captain Mark Sprot, Riddell, Lilliesleaf, Roxburghshire.
S. Strang Steel, Philiphaugh, Selkirk.
Secretary, John Scott, Ploughland, Ancrum, Roxburghshire.

Shetland.

Peter Anderson, Lerwick.
James Budge, Bigton, Levenwiek, Shetland.
R. D. Ganson, Brentham Place, Lerwick.
J. C. Grierson, Helendale, Lerwick.
W. Laidlaw McDougall, Grutness, Sumburgh, Lerwick.
Peter Manson, Lunna, Vidlin, Lerwick.
Laurence Robertson, Setter Voe, Detting, Shetland.
John P. Sandison, Mandeville, Uyeasound, Lerwick.
Secretary, Archibald Sutherland, County Office, Lerwick

Stirling.

His Grace the Duke of Montrose, K.T., Buchanan Castle, Drymen, Glasgow.
Chas. Brown, Kerse Estate Office, Falkirk.
Thos. D. Wallace, Callendar Park, Falkirk.
David Wilson, Carbeth, Killearn, Stirlings.
Secretary, James Learmouth, County Buildings, Stirling.

Sutherland.

J. R. Campbell, Shinness, Lairg.
W. J. Dudgeon, Crakaig, Loth, Sutherland.
Hugh Gibson, Uppat, Brora, Sutherland.
A. Grant, Evelix Farm, Dornoch, Sutherland.
Donald McLean, Sutherland Estate Office, Golspie, Sutherland.
Geo. McIntosh, Pitgrudy, Dornoch, Sutherland.
W. R. Mundell, Dalchork, Lairg.
Secretary, A. S. Innes, Knockarthur, Rogart

Inquiries are frequently addressed to the Board for information as to the whereabouts of Awards under Inclosure Acts passed prior to the General Inclosure Act of 1845.

Memorandum as to the Custody of Inclosure Awards.

2. All awards under the Act of 1845 are in the custody of the Board, and copies thereof are deposited with the Clerk of the Peace for the County concerned, and also with the Churchwardens of the parish or their successors in title. A list of all such Awards made up to the year 1893 is contained in a House of Commons Return (455 of 1893). Awards made under Acts passed between the General Inclosure Act, 1801, and the Inclosure Act, 1845, were in the absence of other provision in the authorising Act, to be enrolled in one of his Majesty's Courts of Record at Westminster, "or" with the Clerk of the Peace for the County, and inquiries as to their present place of deposit and as to opportunity of inspecting them may be addressed to the Public Record Office, Chancery Lane, London, W.C. The place of deposit of Awards made under Acts prior to, or not governed by, the General Inclosure Act, 1801, can be discovered only from examination of the particular provisions of each Act. In many cases these private Acts were not printed, and it would probably be difficult to discover any existing copy of the Act. Lists of local Inclosure Acts from 1727 to 1834 are contained in George Bramwell's Analytical Table of Private Statutes (2 Vols., London: 1813 and 1835). Reference to the Index of Local Acts, 1801–1899 (H.M. Stationery Office: 1900) may also be useful in an endeavour to trace information.

3. It will be seen that considerable difficulty may be experienced in tracing the Awards of Inclosure bearing date prior to 1845. Many of them are included in the House of Commons Return (No, 50 of 1904) of Inclosure Awards deposited with Clerks of the Peace or Clerks of County Councils, who may possibly in certain cases be in a position to supplement the information contained in that Return. Where this source of information fails, it may sometimes be possible to obtain particulars from the Steward of the Manor or from the Parish Council or Incumbent of the Parish concerned, or from Diocesan Registrars or Chapter Clerks.

4. A certain number of Inclosure Awards, or copies thereof, are in the custody of the Public Record Office, the Duchy of Lancaster Office, his Majesty's Commissioners of Woods and Forests, and the Ecclesiastical Commissioners. At the Public Record Office are kept those Awards which were transferred from the Royal Courts of Justice, as well as those transferred with the Land Revenue Records from the Office of Woods and Forests. The Commissioners of Woods and Forests have information only as to the whereabouts of such Awards as affect Crown property.

5. A very few Awards relating to lands in Middlesex are in the keeping of the Land Registry, Lincoln's Inn Fields, London, W.C., as successors to the Middlesex Registry of Deeds; and many relating to lands in Yorkshire (East, North, and West Ridings) are at the Registries of Deeds at Beverley, Northallerton, and Wakefield respectively. There is reason to believe that some Inclosure Awards have found their way into private hands, while a small number are under-

stood to be included in the collections of Manuscripts at the British Museum.

Forestry Museum at the Royal Botanic Gardens, Kew.—During the past few years, through the kindness of numerous contributors, it has been possible to acquire material to form the nucleus of a collection of exhibits illustrating British forestry. This collection is housed in Cambridge Cottage, formerly the residence of H.R.H. the late Duke of Cambridge, which was opened to the public in June last as a Forestry Museum.

With the idea of making the Museum as comprehensive as possible the six available rooms have been apportioned as follows:—

No. 1.—A collection of hand specimens of wood, fruits, seeds, photographs, &c., of various kinds of trees.

Nos. 2 and 3.—Planks, transverse sections of trunks, and trunk specimens of trees, together with mounted herbarium specimens and photographs of trees. Whenever possible, planks are shown 7 ft. long, 3 in. thick, and the width of a tree. Trunk specimens are obtained 6 ft. in length from the bases of trees, showing the buttresses, and transverse sections are 6 in. thick.

No. 4.—A collection of diseases, due to various causes, which are *found amongst forest trees.*

No. 5.—Collections of articles manufactured from British-grown timber, to represent the economic side of forestry.

No. 6.—Various tools and models of machinery used in forestry operations.

With the co-operation of estate owners and manufacturers it is hoped to make this museum as representative as possible of British forestry, and the Director of the Royal Botanic Gardens, Kew, will be pleased to receive contributions of interesting specimens at any time.

Withdrawal of Orders Relating to Foot-and-Mouth Disease in Surrey.—The Board of Agriculture and Fisheries, by Orders which came into operation on the 15th April, withdrew all the restrictions which were imposed by them on the movement of animals in connection with the recent outbreak of foot-and-mouth disease at Chobham, Surrey.

MISCELLANEOUS NOTES.

Importation Regulations.

Importation of Horses into Ceylon.—Regulations dated 2nd February last have been made under the Contagious Diseases (Animals) Ordinance No. 25 of 1909, regarding the importation of horses, &c., into Ceylon. Under these regulations, it is provided that every person importing horses, asses, or mules into Ceylon from oversea ports shall produce a certificate of inspection by a qualified veterinary surgeon certifying that they were free from disease immediately before shipment, and shall give notice of their arrival to the principal Officer of Customs, who shall cause such animals to be inspected before landing by a duly authorised veterinary inspector. No person shall land at any Ceylon port animals suffering from, or suspected to be suffering from, disease,

provided that the principal Officer of Customs may, at his discretion, allow such diseased or suspected animals to be landed and detained in quarantine at such place, and for such a time, as he may deem necessary. Any horse, ass, or mule showing definite evidence of being affected with glanders or farcy shall be destroyed, and any animal showing definite evidence of other disease may be destroyed, if deemed necessary, with the special authority of the Government Agent. Compensation may be paid in respect of animals destroyed, such amount to be half the assessed value of the animal immediately before it was destroyed, provided that the sum paid shall not exceed 350 rupees for a horse or 75 rupees for an ass or mule (*Board of Trade Journal*, March 30th, 1911).

Demand for Agricultural Machinery.

Agricultural Machinery in Roumania.—The *Nachrichten für Handel* (Berlin) of February 28th, contains a report by the German Vice-Consul at Craiova, from which it appears that there is a great demand in Roumania for agricultural machinery and accessories. In this connection the German Vice-Consul considers it very advisable to establish repair shops at one or more Roumanian centres. (*Board of Trade Journal*, March 16th, 1911.)

Agricultural Machinery in India.—Some information as to agricultural machinery and implements in India is given in the report of the Inspector-General of Agriculture on the progress of agriculture for the year 1909–10.

It is stated that progress must take place rather along the lines of improvement of the indigenous types of agricultural implements than by the introduction of those which have been found suitable in Europe. The demand in India is for light and simply constructed implements, capable of being repaired locally, and suitable for bullock traction. For these reasons, in addition to that of their cost, heavy European implements have in most cases been found unsuitable for India. The agricultural associations which have been formed in the various provinces have given much help in the introduction of useful implements and machines, while the agricultural shows and exhibitions that are being held all over India have also been instrumental in popularising their use. In certain provinces, owing to the increasing cost of labour, the need for labour-saving appliances becomes greater every year.

In the Punjab as many as 72 reapers were sold in 1908–9, each costing 255 rupees (£17), and the new machines have mostly gone to the same districts as those bought in the previous year. Co-operative purchasing has increased considerably, the number of partners ranging from three to as many as ten. A new type of winnower designed for dealing directly with the *bhusa* and grain mixture on the threshing-floor has been tried by the Department of Agriculture with excellent results. The problem of implements for wheat threshing has been left in the hands of private engineering firms. Experiments made by the Department at Lyallpur, however, have led to the hope that it may be possible to produce a moderately cheap bullock-power threshing machine that might become popular. A light furrow turning plough, costing from 26 rupees 8 annas to 30 rupees (£1 15*s*. to £2), has been found a success, as also a specially designed spring tooth harrow.

pumps and ploughs. In the Southern Circle of the Central Provinces, chain-pumps, bullock-gears, and turn-wrest ploughs have been selling well, while in the Northern Circle there has been a brisk demand for winnowers. In Bombay, the chief descriptions of implements distributed are ploughs, chain-pumps, and chaff-cutters. In Bengal, the use of the Meston plough has extended considerably. In Burma, an improved type of angle harrow has been found very suitable for the black cotton soil. In this province there is much need for a simple appliance for harvesting ground nut.—(*Board of Trade Journal*, April 20th, 1911.)

Demand for Fencing Material in South Africa.—A report by the Canadian Trade Commissioner at Durban states that the trade in fencing material in South Africa is most important, and is capable of expansion. An immense amount remains to be done before all the farms are properly fenced along the boundaries, and, as the tendency is towards subdividing the land, new boundaries will be formed. In addition to this, the progressive stock farmers are increasingly realising the advantage of dividing their grazing areas into camps.—(*Board of Trade Journal*, April 20th, 1911.)

Agricultural Machinery in Chile.—A report by H.M. Consul at Coquimbo, Chile (*F.O. Reports, Annual Series, No.* 4,632), states that there is an increasing demand for agricultural machinery in that district to supplement an ever-decreasing supply of farm labourers; and although the aggregate quantity of machines of late imported is still insignificant, yet a beginning has been made, and implements of European and American make are more frequently seen than formerly. Only a small proportion of the machinery comes direct to Coquimbo, however, for the bulk is transhipped from Valparaiso, where British and other foreign makers have agencies established and machinery on view. The kind of machinery in demand will be seen from a list of the specimen implements exhibited at a show in 1910, which included threshing, winnowing, and binding machines with and without motors, hay presses, drills, mowers, reapers, harrows, ploughs, horse shovels, chaff-cutters, farm tools, dairy implements, barbed wire, and light windmills for pumping.

Notes on Agriculture Abroad.

Budget of the United States Department of Agriculture for 1911-12.—The Budget of the United States Department of Agriculture for the year ending June 30th, 1912, which was approved on March 4th, 1911, amounts to £3,520,800. The expenditure is two and a half times that sanctioned for the year 1905–6 (£1,394,300), and more than five times the amount for 1895–6 (£659,000).

The principal increase has taken place in the Forest Service, and of the total £483,000 represents the amount paid in salaries of foresters and other officials; while the general expenditure on the forest service, including experiments in connection with forest fires, lumbering, timber testing and preserving, the afforestation of treeless regions, the maintenance of nurseries, collection of seed, planting, and other expenses in

by the construction and maintenance of roads, bridges, telephone lines, and other permanent improvements.

The amount allotted to the Bureau of Plant Industry includes £97,000 for the investigation and control of plant diseases (£73,000 for the cotton boll weevil); £34,300 for the improvement of grazing lands and the encouragement of improved methods of farm management; £29,800 for dry farming experiments and the utilisation of reclaimed land; £118,000 for the investigations and improvement of various crops, including breeding, seed testing, methods of production and sale; and £60,400 for the purchase and distribution of valuable plants and seeds.

The chief items in the expenditure sanctioned for the Office of Experiment Stations are £331,800 for the establishment of and contributions towards the maintenance of experiment stations, including some administrative expenses in connection therewith, £3,100 for nutrition investigations, and £41,700 for irrigation and drainage investigations.

Excluding the amount paid in salaries, the chief expenses of the Bureau of Animal Industry are for the inspection and quarantine of animals, £137,000; eradication of southern cattle tick, £52,100; dairying experiments, £31,250; animal husbandry experiments, £9,900; investigations in connection with animal diseases, £16,400; and co-operative experiments in breeding and feeding, £10,400.

The expenses of the Bureau of Chemistry include £127,100 for the enforcement of the Food and Drugs Act, which came into force in 1906; and those of the Bureau of Entomology, £51,600 for investigations of insects and £59,300 for action against the gypsy and brown-tail moths. The Office of Public Roads is a section of the Department which has been established to inquire into systems of road-making, materials, management, construction, &c., and to give expert advice thereon.

The expenses of the various divisions of the Department are given below, together with the figures for 1905–6, as the comparison shows the directions in which the expenditure has been chiefly extended:—

	1911–12. £	1905–6. £
Office of the Secretary ...	57,600	23,000
Weather Bureau ...	333,400	290,200
Bureau of Animal Industry ...	344,700	320,800
,, Plant Industry ...	429,500	161,800
Forest Service ...	1,152,700	182,300
Bureau of Chemistry ...	200,800	32,300
,, Soils...	54,600	42,600
,, Entomology ...	125,400	23,900
,, Biological Survey ...	29,100	10,800
Division of Accounts and Disbursements ...	20,300	6,700
,, Publications ...	43,700	51,400
Bureau of Statistics ...	48,250	41,900
Library ...	8,400	4,400
Office of Experiment Stations...	388,300	191,200
,, Public Roads...	33,500	10,400

Budget of the Belgian Ministry of Agriculture for 1910.—Provision was made in the Belgian Budget of 1910 for an expenditure on agriculture of £508,000. Of this amount, £9,500 was extraordinary or non-recurring expenditure. The recurring expenditure of £498,500 was made up of the items which are shown in the statement on the following page (*Bulletin du Ministère de l'Intérieur et de l'Agriculture*, January—August, 1910):—

	£
Salaries and expenses of staff at central office and pensions ...	12,000
Salaries and expenses of State agronomists in connection with the inspection of agriculture	7,000
Compensation and other expenses in connection with the slaughter of diseased animals; expenses of the veterinary service	113,000
Subsidies to agricultural committees, associations and exhibitions; and expenses of higher agricultural council	12,000
Veterinary education	9,000
Agricultural education	23,000
Experimental and research work	4,000
Expenses of higher horticultural council. Subsidies to horticultural associations. Subsidy to the International Agricultural Institute	3,000
Collection of agricultural statistics	3,500
Horticultural education	8,000
Expenses of State Botanical Garden	5,000
Chemical and Bacteriological Institute. State analytical laboratories	11,000
Forestry and fishery expenses	48,000
Public health	76,000
Roads, waterways, tramways and carriage of goods	162,000

Live Stock Census in the Netherlands.—Until 1904 the annual agricultural statistics of the Netherlands included statistics of live stock; but in that year it was decided that the annual returns of live stock should be replaced by a periodical census, in order that the returns might be made with greater accuracy than was the case in the annual statistics.

The first periodical census was taken between May 20th and June 30th, 1910. The results are given below, together with the average of the five years, 1900–4, taken from the annual statistics:—

	Census. 1910.	Average. 1900–1904.	Increase.
Horses	327,377	298,351	29,026
Cattle	2,026,943	1,661,903	365,040
Sheep	889,036	698,604	190,432
Goats...	224,231	173,392	50,839
Pigs	1,259,844	—	—

It should be borne in mind that the annual statistics gave the numbers of live stock in December, while the census of 1910 refers to June. This difference has but small importance in the case of horses, but in the case of cattle, it has been calculated that the number existing in June generally exceeds the number in December by about 106,000.

The poor supply of forage in 1909, however, was the cause of the exportation or slaughtering of 133,000 more animals than in 1908. As a certain compensation is brought about by these figures, it may be considered that the census of 1910, despite the difference in the date of collection of the data, gives a fairly exact idea of the increase which took place in the number of cattle.

The number of sheep is much larger in June than in December, as the lambing season is in March and April, and a large number of lambs and sheep are sold for slaughtering in autumn. In the report which accompanies the census returns of 1910 it is stated that, despite the considerable increase shown in the number of sheep, it is probable that the diminution which has been evident in previous returns has

also continued since 1904. (*Bulletin of Agricultural Statistics, Int. Inst. Agric., April,* 1911.)

Method of Estimating the Production and Consumption of Wheat in Canada.—An account of the method in use for the estimation of the figures relating to the production and surplus stocks of wheat in Canada is published in the *Census and Statistics Monthly* for March, 1911.

The estimates of production are based upon returns of reliable agricultural correspondents, and any tendency to exaggeration or to too sanguine estimates is carefully guarded against. The surplus stock is calculated by deducting from the figures of production so obtained the exports of wheat and flour, the requirements for seed, and the consumption of wheat in the Dominion. The method will be seen by reference to the following table, relating to the fiscal years 1908–9, 1909–10, and 1910–11:—

	1908–09.	1909–10.	1910–11.
	bushels.	bushels.	bushels.
Estimated production	112,434,000	166,744,000	149,989,600
Imports for home consumption of wheat and flour	224,000	200,000	336,000 *
	112,658,000	166,944,000	150,325,600
Exports of wheat and flour	57,104,000	63,785,000	61,000,000 *
Balance retained for home consumption, seed, etc.	55,554,000	103,159,000	89,325,600
Seed	13,563,000	16,266,000	18,813,000
	41,991,000	86,893,000	70,512,600
Consumption at 6·24 bush. per head ...	44,833,000	46,736,000	48,578,000
Deficiency or surplus	-2,842,000	40,157,000	21,934,600

* Estimated.

In the foregoing statement the requirements for seed are reckoned at the average rate of 1·75 bushel per acre upon the acreage of the following year, while the estimate of consumption at the rate of 6·24 bushels is based upon the statistics of production at the census of 1901 and the imports and exports of that year, the population of Canada being estimated as 7,184,744 in 1908–09, 7,489,781 in 1909–10, and 7,784,900 in 1910–11.

The table shows a deficiency for 1908 which would have to be made good from the stocks held over from 1907, of which there is no record. In 1909 a proportion of the surplus would be required to replenish depleted stocks in the elevators and mills; and in this connection it will be noticed from the table that while the production of 1909–10 is 54,000,000 bushels in excess of 1908–09, the export is only about 7,000,000 more.

It may be reckoned that about 5 per cent. of the total production, as above estimated, should be deducted owing to losses in cleaning, &c., and if we put the average losses from frosted and other grain used for feeding at 3 per cent., a total reduction of 8 per cent. reduces the above

surpluses by 13,340,000 bushels, or to 26,817,000 bushels in 1909–10, and by 11,999,000 bushels or to 9,936,000 bushels in 1910–11.

Value per Head of Live Stock in the United States.—The rise in the value of live stock on farms in the United States during the past twenty years is shown in the following table, compiled by the Bureau of Statistics of the United States Department of Agriculture from the reports of its agents and correspondents, giving the value per head of farm animals of all ages on January 1st in each of the years mentioned (*U.S. Crop Reporter, February, 1911*):—

Animals.	1911.		1910.		1909.		Average 1900–1909.		Average 1890–1899.	
	£	s.	£	s.	£	s.	£	s.	£	s.
Horses	23	5	22	11	19	19	15	0	10	1
Mules.........	26	3	24	19	22	9	17	14	12	5
Milch Cows	8	9	7	9	6	15	6	6	4	17
Other Cattle	4	7	4	1	3	13	3	15	3	9
Sheep................		16		17		14		13		9
Swine...	1	19	1	18	1	7	1	7	1	0

Nitrate Industry of Chile.—According to a report by H.M. Consul at Antofagasta (*F.O. Reports, Annual Series, No.* 4,633), the present condition of the nitrate industry of the district may be considered as satisfactory and its prospects exceptionally good, as the demand for nitrate of soda is steadily increasing year by year. Most producers feel that a still further improvement could be reached by combining with a view to selling the article direct to the consumer in the various centres at a fixed and uniform price, and thus do away with the present speculative operations. It is felt that stability in price would do a great deal towards furthering the employment of nitrate as a fertiliser, and that a slightly better price to the producer could be expected under such conditions. Tentative proposals have been put forward in this direction, but so far no definite line of action has been decided upon.

In 1909 a total sum of £88,400 was expended on propaganda in the chief countries of the world for making known the advantages of nitrate as a fertiliser, of which sum the Chilian Government contributed £40,000. The steady increase in the yearly consumption throughout the world is shown in the following figures:—

CONSUMPTION OF NITRATE OF SODA FOR THE YEARS 1906–10.

	1906.	1907.	1908.	1909.	1910.
	tons.	tons.	tons.	tons.	tons.
Europe	1,275,000	1,279,000	1,412,000	1,497,000	1,690,000
United States ...	364,000	362,000	317,000	418,000	583,000
Other countries ...	40,000	46,000	52,000	71,000	17,000
Total	1,679,000	1,687,000	1,781,000	1,986,000	2,290,000

The month commenced with both temperature and rainfall below the average, and ended with a generally high temperature and heavy rainfall.

Notes on the Weather in April.

During most of the *first* week (March 26th to April 1st), the weather over the greater part of the country was dry, and temperature was below the average except in Scotland N. and England N.W., although warmth was everywhere classed as "moderate." The amount of bright sunshine recorded was scanty in the eastern and midland counties of England.

A heavy rainfall which occurred in the south-east of England at the end of the first week continued into the beginning of the *second* week. Over the whole week, however, rainfall was less than the average except in the English Channel. In the middle and end of the week, the general character of the weather was very wintry, warmth being either "deficient" or "very deficient," the deficit from the normal reaching 8° in England S.E. Bright sunshine was also less than the normal generally.

The weather improved during the *third* week, and was fair to very fine over Great Britain generally, although a good deal of cloud prevailed in Scotland and the north-east of England. There was a considerable rise in temperature, unusual warmth being experienced in Scotland and England N.E. Rainfall continued below the average, "very light" falls being recorded in the midland and north-western counties, and no rain falling in England S.W. Bright sunshine exceeded the average except in Scotland and England N.E.

The weather during the *fourth* week continued fair or fine in the east and south of England, and over a considerable portion of the Midlands, but in Scotland and the western districts of England rain fell very frequently. Warmth was "unusual" in the eastern, midland, and north-western districts of England, and "moderate" in the south-eastern and south-western districts; the excess above the average was as much as 5° in England E. and N.E. "Scanty" sunshine was recorded over Scotland and England N.W. and S.W., and "moderate" sunshine in the other parts of England.

In the *fifth* week, the conditions were unsettled and showery throughout the country, and the sky was seldom free from cloud. "Very heavy" rainfall was experienced in England N.W. and S.W., and in Scotland W. and elsewhere the fall was "heavy." The excess, however, was more moderate in the east of England than in the rest of the country. In all districts temperature was above the average, although the excess was not large, and bright sunshine was below the average.

Notes on Crop Prospects Abroad.

The International Institute of Agriculture, in its Bulletin of Agricultural Statistics for April, 1911, gives the condition of the autumn and winter sown cereals in various countries on April 1st, 1911, compared with the condition on the same date in 1910, as in the table on the next page.

It is explained that, although given in numerical form, these expressions of the conditions are necessarily only approximate, being

based solely upon the appearance of the vegetation, which is sometimes deceptive.

It should further be noted that, when the condition of the crop is expressed by, say, 120, no matter how carefully this judgment may be made, nor how great an expert may be the person judging the condition, this does not mean that an outturn ⅕ greater than the average *will be obtained*, but only that the present condition is *such as to predict* a yield ⅕ above the average. The present condition may change from one moment to another, and the numerical expression must then also change. For example, the condition of a certain crop to-day is such

	Wheat.		Rye.		Barley.		Oats.	
	April 1st, 1911.	April 1st, 1910.	April 1st, 1911.	April 1st, 1910.	April 1st, 1911.	April 1st, 1910.	April 1st, 1911.	April 1st, 1910.
Belgium ...	105	90	110	95	105	95	—	—
Denmark ...	104	97	108	97	—	—	—	—
Spain	105–110	—	105–110	—	105–110	—	105–110	—
Luxemburg ...	100	90	100	95	102	94	100	—
Netherlands ..	108	110	111	105	108	110	—	—
Sweden ...	100–110	100	95–100	100	—	—	—	—
Switzerland ...	95	96	94	92	100	103	—	—
Japan	100	98	—	—	100	—	—	—

(100 = average yield of past ten years. Particulars of the areas sown in the autumns of 1910 and 1909 were given in the *Journal* for March, p. 1037.)

as to give hope of a yield 20 per cent. above the average, and this condition is represented by 120. A fortnight later, floods or insect pests may make this estimate fall to 90 per cent. of an average yield, which means that at the end of this fortnight the condition is represented by 90.

The following supplementary information as regards the condition of the autumn-sown crops in various countries not included in the above table is also given:—

United States of America.—The following table shows the conditions of winter wheat and of rye on April 1st, 1911, expressed in a percentage of a "normal" condition:—

Crop.	Conditions on April 1st.		
	1911.	1910.	Average 1901–1910.
Winter wheat	83·3	80·8	86·9
Rye	89·3	92·3	90·2

France.—Weather conditions were exceedingly favourable during the first three weeks of March. The spell of cold weather during the last days of March proved of short duration, and the crops are now strong enough to resist any further attack of ungenial weather. On

April 1st the conditions of wheat, barley, and oats were good, and of rye, average.

Hungary.—Though the winter has been long, and little snow has fallen to protect the crops, they have only slightly suffered, and progressed well during the mild weather in March. Damage caused to cereal crops by mice: 7·2 per cent. of the total area sown. Damage caused to cereal crops by frost: 3·1 per cent. of the total area sown. Area resown: 2·8 per cent. of the total area sown.

Italy.—The condition of the winter cereals is good almost everywhere.

Roumania.—The condition of wheat and rye is good, of barley average, and of oats excellent. Weather conditions are favourable.

Russia in Europe.—Though the past winter has proved a cold one, it has not unfavourably affected the wheat crop, except in the south-east of the country. Snow has been relatively scarce, and disappeared in the south and south-east (Government of New Russia) by the beginning of March. In the rest of European Russia the crops were still under snow at this date.

Tunis.—On April 1st the condition of wheat, barley, and oats was good.

Germany.—The report of the Imperial Statistical Bureau gives the condition of the crops in the middle of April as follows:—Winter wheat, 2·7; winter rye, 2·8 (2 = good, 3 = average). Considerable damage from mice was reported from some districts, and it is feared that their ravages will be extended in the immediate future. On the whole, the condition of the winter-sown crops is not especially favourable.

France—Damage to Crops by Frost.—According to a dispatch, dated April 20th, received from H.M. Consul-General at Marseilles, great damage was caused to the crops in the south of France by the frosts which occurred early in April. The fruit crops have either suffered severely or been entirely lost in the Departments of Bouches-du-Rhône, Gard, Hérault, Vaucluse, Ardèche, Pyrénées Orientales, and Var. In the Basses-Alpes, Vaucluse, and Ardèche, almonds have suffered. Vegetables have been destroyed in Bouches-du-Rhône, and Gard; potatoes have been damaged in Vaucluse.

Production of Cider and Perry in France.—According to the report of the French Ministry of Agriculture, the production of cider and perry in France during 1910 is estimated at 237,485,000 gallons, as compared with 174,861,000 gallons in 1909 (*Journal Officiel*, December 22nd, 1910).

Austria.—The Ministry of Agriculture gives the condition of the crops in the middle of April as follows:—Wheat, 2·6; rye, 2·9; barley, 2·8; oats, 2·6 (2 = over average, 3 = average). Wheat and rye have come through the winter well, but are backward owing to the cold weather at the beginning of April. The young shoots of late-sown plants, especially rye, have suffered from frost. The unfavourable weather also delayed spring sowings of barley and oats.

Fruit Crop of Austria.—The fruit crop was reported to be in a healthy condition at the end of March, owing to the absence of winter frosts, especially in the north of Austria. The damage caused by

The formation of wood is quite satisfactory. The blossoming is backward on account of the cold weather of March. (*Statistische Nachrichten*, April 11th, 1911.)

Argentina.—H.M. Chargé d'Affaires at Buenos Aires reports that there were heavy rains at the end of February which were of great benefit, improving the prospects of late-sown maize, and enabling field work to be proceeded with. Only slight rains occurred, however, throughout March.

Bulb Crop of Netherlands.—H.M. Consul at Amsterdam reports that, according to the *Handelsblad*, the bulbs in the Lisse district were seriously damaged by the frosts in the early part of April. The extent of the damage could not be estimated, but it was feared that the crop would be a total failure. Similar reports have been heard from bulb growers in the neighbourhood of Haarlem.

The President of the Local Florists' Association of Lisse, however, in a communication of April 20th to H.M. Consul, calls in question the accuracy of the above statements, and reports that the hyacinths in the district of Lisse look excellent; the early flowers were killed by frost, which, however, did not hurt the leaves, and a good crop is expected.

Further statements in the *Handelsblad* also indicate that the damage due to frost was overestimated, and the prospects for hyacinths and other bulbs are now considered to be good, both as regards quality and quantity. (*Board of Trade Journal*, April 13th and 27th, and May 4th, 1911.)

Russia.—A report by the official *Commercial Gazette* of St. Petersburg, of April 16th, on the condition of winter grain in South Russia in the middle of April, has been forwarded by H.M. Commercial Attaché at St. Petersburg. The report states that as a result of the meteorological conditions prevailing and of the very late appearance of spring, the condition of winter grain in the south of Russia, so far as it is yet possible to report, gives rise to no anxiety. In general the reports are fully satisfactory, rye especially having suffered less than other grains from change of weather. Wheat in places is not quite so satisfactory.

Bulgaria.—The *Nachrichten für Handel* (Berlin) of April 20th publishes the following crop report for Bulgaria:—

The weather in Bulgaria during the past winter has not been particularly favourable to the development of winter seeds. During the early part of the winter the weather was extremely mild and damp, with little snow, and not until the second half of January were there any strong winds and severe cold. In the north-east districts of Bulgaria, however, heavy falls of snow protected the seed from frost, but in other parts of the country there was little snow, and it did not remain long on the ground. Owing to the mild weather in March the prospects are at present very good for spring seeds. The vineyards and orchards are in good condition and have not suffered from frost.

United States.—The Crop Reporting Board of the Bureau of Statistics of the Department of Agriculture estimates, from the reports of its correspondents, the area under winter wheat on May 1st as 31,367,000 acres, as compared with 29,044,000 acres and 27,871,000 acres on the corresponding dates in 1910 and 1909. The average con-

dition on May 1st is given as 86·1 against 82·1 on May 1st, 1910, 83·5 on the same date in 1909, and 86·1 the mean of the averages of the past ten years. Indications point to a yield of 15·6 bushels per acre, and a crop about 5·4 per cent. larger than last year.

The average condition of winter rye on May 1st is given as 90·0, the condition on corresponding dates in 1910 and 1909 being 91·3 and 88·1 respectively. (*Dornbusch*, May 8th, 1911.)

Hungary.—The Hungarian Ministry of Agriculture, reporting on the condition of the crops on April 25th, states that the warm windy weather in the latter part of April caused dryness of the soil, which was unfavourable to the development of the autumn and spring-sown cereals. A mild rain is needed.

Crop Conditions on May 1st.

The Crop Reporters of the Board, in reporting on agricultural conditions on May 1st, state that the very cold and mostly dry weather of the first part of the month checked vegetation generally, but that the rains and more seasonable temperature at the end of the period induced considerable improvement in the prospects. No damage to the corn crops from the severe weather at the beginning of the month is reported; but, as a result, the season may be regarded as being somewhat late on May 1st. Wheat is looking healthy, though backward in many districts; that sown earliest in the autumn, of course, presents the more satisfactory appearance. Much the same may be said of barley and oats, both of which are looking well, except that poor reports are received concerning oats in Kent. Sowing is, in both cases, practically finished over the greater part of England, but a good deal had still to be done in the north; in Scotland work was very forward. Beans are healthy and vigorous, and promise well, although, like the other crops, they are backward in many districts. Peas seem, as a rule, fairly satisfactory.

The season for planting potatoes has proved very favourable nearly everywhere (except in the extreme south-east), and the seed has gone into the ground under good conditions. The work is well forward in all the important potato districts; practically completed in some. From Lincoln comes a report that, owing to the high prices, the area under this crop is this year being increased. The early crop in Cornwall is reported to have been severely damaged by frost.

Sowing of mangolds was generally in full swing and being carried out under good conditions, although in many places the weather had not proved suitable till towards the end of the month, so that in such districts this operation was somewhat behindhand.

There is generally abundance of blossom on all kinds of fruit trees. The more noteworthy exceptions are Norfolk, where the cold winds have kept back the orchards and bush fruits, parts of Lincoln, where gooseberries have been badly damaged, and Kent and Surrey, where early gooseberries have been injured. Elsewhere the severe frosts at the beginning of the month appear to have come too early to effect any material injury.

"Seeds" are generally healthy, the rain at the end of the month having been of great benefit, although more is still required. There

is, however, very general mention of a scarcity of clover plants (except in Scotland); and sainfoin also appears to be a thin or weak crop. Pastures were everywhere short of grass at the middle of April, and live stock out at grass consequently did not thrive particularly well; in this case also, however, the rains and more genial temperature at the close induced growth and a general improvement.

Except in the hilly districts, lambing is mostly now finished in England. In the central belt of England the fall of lambs has hardly been over average, while the severe weather at the beginning seems to have caused somewhat heavier losses than usual among ewes or lambs. In the lowlands of the north of England, Wales, and in Scotland, the fall of lambs is about average or in some places more, especially in Scotland. In the hills, lambing is mostly just beginning, and it is too early to report anything definite; but where it is more advanced in the north of England, moorland ewes are reported to be lambing indifferently, and there is considerable mortality.

Agricultural Labour in England during April.

The Board of Agriculture and Fisheries have been furnished by the Board of Trade with the following report, based on returns from correspondents in various districts, on the demand for agricultural labour in April:—

Agricultural employment was generally regular throughout April, and there was a fair demand for men outside the regular farm staff for such work as hoeing, carting manure, preparing the land for root crops, planting potatoes and threshing. The supply of such men was usually sufficient for the demand, hut mention of a surplus in the reports was exceptional. Men for permanent situations, especially where the work involved Sunday duty, were again reported as scarce in parts of the Midland, and more particularly the Southern and South-Western Counties.

Northern Counties.—There was not much demand for extra labourers in *Northumberland* and *Durham*, but outside these counties such men were generally in fairly good demand, though their employment was somewhat interrupted by bad weather in the western districts. With the exception of the Bridlington and Norton Rural Districts in *Yorkshire*, where a surplus of extra labourers was reported, the supply of these men was usually balanced by the demand in the districts reported on. There was a surplus of men for permanent situations in the Patrington Rural District (*Yorkshire*). No general change in wages was reported at the hiring fairs for farm servants which took place in *Durham*.

Midland Counties.—Extra labourers in these counties were usually in regular employment, though some men lost a little time at the end of the month through rain. The principal operations at which such men were employed were carting manure, threshing, hoeing, planting potatoes, and cleaning the land for root crops. Some scarcity of men for permanent situations was again reported in several districts.

Eastern Counties.—There was a fairly good demand on the whole for extra labourers in these counties, which arose chiefly from such work as hoeing, cleaning fallows for turnips and mangolds, carting

manure, and threshing, and little or no time was lost by men through bad weather. The supply of and demand for labourers were usually about equal, but some scarcity of men was reported in the Welton and Spilsby (*Lincolnshire*) and Orsett (*Essex*) Rural Districts, while there was a surplus of men in the Newmarket (*Cambridgeshire*), and the Henstead and Thetford (*Norfolk*) Rural Districts, and in part of the Thingoe (*Suffolk*) Rural District.

Southern and South-Western Counties.—Hoeing, carting manure, planting potatoes, cleaning the land for root crops, threshing, and hedging provided a fair amount of work for extra labourers, and the weather being unusually fine, most men were in regular employment throughout the month. Several correspondents mentioned that there was less hoeing to be done than usual on account of the dry weather, but there was no marked surplus of labourers in any of the districts reported on. Men for permanent situations were reported as scarce in a number of districts, particularly where the work involved Sunday duty, like milking.

THE CORN MARKETS IN APRIL.

C. KAINS-JACKSON.

The depression which marked the grain trade up to the close of March continued until after the Easter holidays, but trade was very active in the last week of the month. The business for actual consumption was also much increased, and prices were altered in holders' favour for nearly all the principal staples.

Wheat.—Many local markets have continued to record an average a little below thirty shillings, but London has shown improvement in value, closing half a crown above the thirty shilling level. India, with a larger crop than in 1910, has not hurried shipments forward, 421,000 qr. constituting the April clearances for 1911, as compared with 504,000 qr. for April, 1910. The average price is about 35*s*. per 492 lb. Canadian wheat has been forthcoming in fair quantity, the closing price being 38*s*. 6*d*. for best quality. The wheat shipments of North America were 665,000 qr., but these returns do not distinguish Canadian from United States exports. The large supply of Australian has kept that sort from more than 9*d*. advance, 37*s*. against 36*s*. 3*d*., but Russian, American red, and also Argentine have been 1*s*. to 1*s*. 3*d*. dearer. The Russian shipments for April were 1,859,000 qr., and Europe S.E. sent off 677,000 qr.; total for this region, 2,536,000 qr. In April, 1910, Russia shipped 2,731,000 qr., Europe S.E. 190,000 qr.; total 2,921,000 qr.

Flour.—Standard flour has continued to sell well, the sale helping in the disposal of much flour which was satisfactory in condition and stamina but below an average in colour. The closing prices of April were 32*s*. for top-price American, 31*s*. for top-price London, and also Canadian, 29*s*. for Town whites and best Country, 26*s*. for No. 1 Households, 24*s*. 6*d*. for No. 2 Households, 27*s*. for London Standard, 24*s*. 9*d*. for Country Standard, and 40*s*. for Hungarian. It will be noted that the last-named top-quality pastry sort is decidedly dearer,

and we hear of bakers making an increased use of "London-made by Hungarian process," the price of which is 32*s.* per sack. North American shipments for April were 609,000 sacks, and 180,000 sacks were on passage on the last day of the month.

Barley.—The price of British showed little improvement on the month, but the closing markets were in sellers' favour, and a definite advance in May was regarded as not improbable. From the 24th to the 29th Russian barley led the way with fully 1*s.* rise, and the trade in 448 lb. kinds showed 6*d.* to 9*d.* improvement. Closing prices were 30*s.* to 32*s.* for Californian brewing; 32*s.* to 34*s.* for screened Anatolian; 27*s.* for Roumanian, all per 448 lb.; 22*s.* to 22*s.* 6*d.* for Russian; 21*s.* 6*d.* to 22*s.* for Persian, each per 400 lb. Barley shipments in April were 1,745,000 qr. from Russia, 279,000 qr. from Europe S.E., and 9,000 qr. from California. There were on the 30th 330,000 qr. on passage, viz., 25,000 Russian, 25,000 Anatolian, and 280,000 Californian. Average expectations include a much larger proportion of feeding barley.

Oats.—British oats, as usual in April, showed a tendency to advance in price, especially at Mark Lane, to which fine and heavy samples have a tendency to gravitate. The New Zealand oats arriving during April also sold increasingly well. The total supply of oats on passage is very heavy, but includes singularly little heavy corn; indeed, 90 per cent. of the expected arrivals are regarded as likely to weigh 304 lb. only to the quarter. The rise on the month in Russian was 1*s.*, and in Argentine 6*d.*, these types closing at 15*s.* 6*d.* and 15*s.* for f.a.q. The Russian sort has appreciated more than the Argentine for quality reasons; it is in most cases the better sample at the same weight. The chief rival shippers in April sent off: Russia, 928,000 qr., Argentine, 792,000 qr.

Maize.—Reference was made a month ago to the exceptional cheapness of this staple, to the moderate quantity on passage, and to the small reserves in the port warehouses. Those who drew conclusions from these facts and had capital enabling them to act are now more fortunately placed than those who have maize to buy on a risen and rising market. At the close of April 22*s.* 6*d.* to 23*s.* ruled for American, 24*s.* to 24*s.* 6*d.* for Roumanian, 23*s.* 6*d.* to 23*s.* 9*d.* for South Russian, 25*s.* to 25*s.* 3*d.* for Argentine, and 26*s.* to 27*s.* for South African, a sort which at present is in more demand than supply. April shipments were 788,000 qr. from North America, 24,000 from South America, 422,000 from Russia, 509,000 from Europe S.E., and 25,000 from South Africa. Small quantities were also shipped by India and Burma. On the 30th only 260,000 qr. were on passage. The Argentine harvest was estimated by a leading trade firm as having yielded 2,350,000 qr., available for export, against 11,743,000 qr. actually exported in 1910. The market naturally closed with especial firmness for the yellow sort, for which we principally depend on the River Plate.

Oilseeds.—Egypt from September 1st, 1910, to April 30th, 1911, shipped 416,000 tons of cottonseed, against 182,000 tons last season, yet on the 30th £8 3*s.* 9*d.* per ton was paid in London. An exceptionally vigorous demand is thus disclosed. Indian seed made £6 per ton, which, as the two sorts are averaged at £2 per ton quality

difference, is a comparatively depressed price. The linseed market at Buenos Aires fell 3*s*. per qr. on the month, but only 229,000 qr. were shipped, while India showed more relative firmness, yet managed to ship 508,000 qr. It will be manifest that the whole trade in these much-needed feeding stuffs and fattening foods is quite unsettled, and that no forecast can usefully be attempted. On the 30th there were 172,000 qr. of linseed and 30,000 tons of cottonseed on passage to the United Kingdom.

Various.—Soy beans are costing about seven guineas per ton, of which £1 6*s*. goes for freight and insurance, and £6 1*s*. remains for grower and merchant. The demand, though still excellent, is not quite what it was in 1910, the year succeeding the "discovery" of these beans, as highly valuable fattening feeding stuffs. Beet sugar has declined 2*d*. per cwt., but many expect a recovery shortly. Indian peas are in unusually large offer, and at 6*s*. per cental for sound white are a good bargain. Lentils from India vary much in type and value, so that prices in turn range from 5*s*. to 6*s*. per cental. The price of gram, 5*s*. per cental, makes this staple, which is botanically very much the same as our chick pea, an article strongly to be recommended, seeing that its Indian drawback—it causes a partial paralysis of animals fed on it exclusively and for a long period—is not one within the range of probable occurrence in this country. Indian dari at 24*s*. per 480 lb., Argentine canaryseed at 44*s*. per 464 lb., screened, and good Burmese hand-picked haricot beans at 37*s*. per 504 lb., are among the minor staples for which at prices asking there should, on feeding value, be a steady demand.

THE LIVE AND DEAD MEAT TRADE IN APRIL.

A. T. MATTHEWS.

Fat Cattle.—Supplies of fat cattle have been about normal as regards numbers, and above the average for quality and finish; indeed, at a large number of markets the quality has been described as excellent. This was certainly the case in London, where it was by no means uncommon for prime Norfolk Shorthorns to realise over 40*s*. per live cwt. Prices have varied but little throughout the month, but they have been decidedly better than those of March, as will be seen by the following averages:—Shorthorns averaged 8*s*. 3¼*d*., 7*s*. 7*d*., and 6*s*. 6½*d*. for the three qualities, against 8*s*. 0¼*d*., 7*s*. 4½*d*., and 6*s*. 4*d*.; Herefords, 8*s*. 6*d*. and 7*s*. 11*d*., against 8*s*. 3½*d*. and 7*s*. 8*d*.; Devons, 8*s*. 5½*d*. and 7*s*. 8½*d*., against 8*s*. 1¾*d*. and 7*s*. 4*d*.; Welsh Runts, 8*s*. 2*d*. and 7*s*. 7½*d*., against 7*s*. 11¼*d*. and 7*s*. 5*d*.; and Polled Scots, 8*s*. 4½*d*. and 8*s*., against 8*s*. 1½*d*. and 7*s*. 9½*d*., per 14 lb. stone. Roughly speaking, there was an average advance of ¼*d*. per lb. for the month in the English markets. The Scotch markets were also very firm till the last week, when some weakness was shown compared with the strong tone prevailing in England.

In the last week there were signs that the supplies of stall-fed cattle were beginning to fall off, those from Ireland being nearly finished, and as the season advances, it seems extremely probable that

prices may further advance. They are still some 7¾d. per stone, or nearly £3 per head on bullocks of average weight, lower than in July of last year. Considerable confidence is evidently felt by graziers, who are paying very high prices for stores, and the annual lettings of grass-keeping for summer grazing are being made at high figures.

Veal Calves.—The scarcity of prime veal calves has continued, and those of fair merit have maintained the March averages of 9¼d. and 8¼d. per lb. There have been very large numbers slaughtered immaturely, and these have fetched low prices. Thousands of these calves would probably have paid well for rearing.

Fat Sheep.—As a large proportion of the fat sheep have been clipped and weather conditions have more or less affected the sale of those out of the wool, it is more difficult to trace with certainty any fluctuations in the real value of mutton. Downs in the wool averaged 8½d. for first, 7½d. for second, and 6d. for third quality, against 8¾d., 7¾d., and 6d. in March, thus showing a decline of ¼d. per lb. The Longwools averaged 8½d., 7½d., and 5½d., against 8½d., 7½d., and 5¾d. Longwools therefore sold relatively better than Downs, probably owing to the greater value of their fleeces at this season. Clipped Downs averaged 7d., 6½d., and 5¼d. per lb. for the three qualities, and Longwools 6½d., 6d., and 4¾d. Irish Longwools were quoted up to 9¾d. per lb. at Liverpool in the last week of April. Owing to the wintry weather considerable losses were incurred by clipping during March and early in April, always a more or less speculative proceeding. The fear of damage to the meat by chilling deterred butchers from purchasing, and in many cases the difference in the value of the mutton of the naked sheep was greater than that of the fleece. Latterly, however, clipped sheep have sold much better in proportion, and at present prices for wool it will pay better to keep it. London buyers much prefer clipped sheep when the weather is suitable, and it often happens that the sender gets very little for the wool on the sheep's back at Islington market.

Fat Lambs.—The value of fat lambs has very largely depended on the markets to which they were sent, for the trade has been extremely irregular and the range of prices wide. Thus far the Metropolitan market has been quite one of the very lowest in the country. Taking thirty-seven British markets the April average was 12½d. for first, and 11d. for second quality, while the top London price was about 10¼d. In the last week the highest price quoted was 15d. at Hull, several other markets reported 13d. and 12d., but in London it was only 10¼d. for the choicest Down lambs. At Bristol, however, it was still lower, for there 9d. was the top price.

Fat Pigs.—The average price of bacon pigs in British markets was 7s. 3¼d. for prime small, and 6s. 7½d. for larger pigs, showing practically no change from March values, but about 9d. per stone below those of October.

Carcass Beef—British.—The trade for British beef in London was quiet, but values were fairly steady. Scotch long sides averaged 6¾d. and 6¼d., and English 6d. and 5¾d., per lb. Short Scotch sides fetched 6¾d. to 7d.

Port-Killed Beef.—Deptford-killed American beef averaged 5¾d. per lb. for the best quality

Chilled Beef.—As regards States chilled beef, it is noteworthy that frequently during April there was none worth quoting on the London market. Best hindquarters fetched 6¼*d.* to 6½*d.* per lb., and forequarters 4*d.* to 4¼*d.* Argentine chilled was plentiful, and a clearance of exposed stocks was often impossible. Prices were slightly lower than in March, the averages in the Smithfield Market working out at 4*d.* to 4½*d.* for hindquarters, and 2¾*d.* to 3*d.* per lb. for forequarters.

Frozen Beef.—The value of frozen beef gradually declined all the month, best hindquarters averaging 4*d.*, and forequarters about 2¾*d.*, per lb.

Carcass Mutton—Fresh-Killed.—Mutton has been very slow of sale and trade dragging for all except the smallest sizes. Very light Scotch tegs have occasionally fetched 8½*d.* per lb., but fluctuated to the extent of ½*d.* per lb. Their average was 8*d.* Excellent Scotch mutton of very moderate weight made 7*d.*, and larger sheep 6*d.*, per lb. The value of English was 6*d.* to 6½*d.* per lb. for good West Country tegs.

Frozen Mutton.—This article sold at very low prices. The best New Zealand has stood for three weeks at 3¼*d.* per lb., Argentine at 3*d.*, and Australian a fraction less.

Carcass Lamb.—British lamb was unusually cheap, and the choicest only averaged 10½*d.* per lb., large quantities being sold at 9*d.* and under. The top price of the best frozen (Canterbury) was 5*d.*, and that of Argentine about 4¼*d.*

Veal.—Prime quality British varied from 8*d.* to 8½*d.* per lb., but 6*d.* was the outside value of middling carcasses.

Pork.—Small pigs have fetched 7*d.* to 7¼*d.*, and medium sizes 6¾*d.*, per lb. There has been a good demand for heavy sows in London at 5*d.* per lb. for sausage making.

THE PROVISION TRADE IN APRIL.

HEDLEY STEVENS.

Bacon.—Although on the whole the demand was a little better than during March, dealers are disappointed with the month's trade. In spite of the fact that prices were considerably below those current at the same time last year, the consumption was still less. Owing to the cold weather just before Easter, the demand for the holiday trade was much less than had been expected, but towards the end of the month orders were a little more free.

The arrivals from Denmark were not quite so heavy as during the previous month. Prices for this description remained steady, but agents found some difficulty in clearing up their stocks before the next shipment arrived. The imports from Russia were fairly large, and in some cases pressure was brought to bear in order to effect sales, which resulted in lower prices all round. The top price for the month was about 54*s.* per cwt., with secondary grades selling at around 48*s.* per cwt. The shipments from Holland were small, but they are likely to increase in the near future. Canada continues to ship us bacon in slightly increased quantities; prices for the month remain about unchanged.

American bacon was again cheaper, and with hogs being marketed daily in larger numbers than last year, it is anticipated that prices will

show a further reduction, and so stimulate the consumption. The average weight of the American hogs being killed is still heavy; feed being plentiful and cheap, breeders are fattening their stock for a longer time before sending to the markets. The prices for hogs at Chicago during April, 1911, ranged from $5.75 to $6.85, against $8.85 to $10.70 last year, and $6.65 to $7.50 two years ago.

English pigs were again offered in small quantities, and on some markets they show up slightly dearer on the month. Lower prices, however, are anticipated in May.

Cheese.—The improvement in prices reported last month continued during April, although at the end of the month, as a result of some manipulation, there were a few cheaper sellers of New Zealand cheese, as it is felt by some that any advance on last season's goods is undesirable at the opening of the Canadian season for new makes.

The consumption during the month was a little better, and with stocks small in England, still higher prices are looked for in May on all descriptions of last season's goods. Very few Canadian fodder-makes have been sold so far for shipment to this country, as the season is backward and the home demand sufficient to clear nearly all the available lots at equivalent to 56*s.*–57*s.* c.i.f.

The latest advices from Canada point to a large make during this year, as the cattle have wintered well, feed being plentiful all along. It is also reported that the United States buyers have not contracted for cream to be shipped over the border as last season, which, of course, means that more butter and cheese will be manufactured in Canada, and available for export. A few more lots of States cheese were imported during the month, but it is understood that all surplus stocks are now nearly cleared. It is some years since any quantity of full cream States cheese has been exported to England, but a fair number of shipments have been made to all ports during the last two months. New Zealand makes are going more freely into consumption. Over 3,000 crates (6,000 cheese) will arrive during May.

At the end of the month the estimated stock of Canadian cheese at the three principal distributing centres (London, Liverpool, and Bristol) were 89,000 against 114,000 at the same time last year, and 95,000 two years ago. The stock of New Zealand cheese was 31,500 crates in London and Bristol, against 51,000 crates last year.

Butter.—Business was mostly of a retail character, and prices show little change on the month. The arrivals from Australia were large, but on account of the delay to a steamer the deliveries of New Zealand were smaller. The demand continues chiefly for best creameries, prices being such that all consumers can afford to have the best quality. In consequence, stocks of secondary grades are still increasing, and prices favour buyers. During May the arrivals from the Colonies will be large, and prices are expected to go lower.

The home demand in America improved during the month, resulting in the low cable offers being withdrawn, although the stocks in cold store at the four principal markets (Chicago, New York, Boston, and Philadelphia) early in April were 284,764 lb. more than at the same time last year. Arrivals from Siberia are now reaching this country regularly, and the quality is very fine. Prices range from 96*s.* to 100*s.* per cwt. In Ireland the conditions are favourable for a large make.

PRICES OF AGRICULTURAL PRODUCE.

VERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of April, 1911.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	ENGLAND.		SCOTLAND.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK:—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle:—	s. d.	s. d.	s. d.	s. d.
Polled Scots	8 5	8 0	40 2	37 3
Herefords	8 7	7 11	—	—
Shorthorns	8 3	7 7	39 1	36 7
Devons	8 6	7 9	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	9½	8¼	9¼	7¼
Sheep:—				
Downs	8¼	7¼	—	—
Longwools	7½	6¼	—	—
Cheviots	9¾	8¾	8¾	7¾
Blackfaced	9½	8	7¾	6¾
Cross-breds	8¼	7¼	8¼	7½
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs:—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	7 3	6 9	7 4	6 4
Porkers	7 9	7 1	7 9	6 11
LEAN STOCK:—	per head.	per head.	per head.	per head.
Milking Cows:—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	22 2	18 9	21 2	17 9
,, —Calvers... ...	21 9	18 8	20 0	17 5
Other Breeds—In Milk ...	19 16	16 3	18 14	15 14
,, —Calvers ...	14 5	13 5	19 5	16 2
Calves for Rearing	2 7	1 16	2 17	2 1
Store Cattle:—				
Shorthorns—Yearlings ...	10 15	9 4	11 8	9 13
,, —Two-year-olds...	14 19	13 4	16 18	14 0
,, —Three-year-olds	18 4	16 2	18 4	15 7
Polled Scots—Two-year-olds	—	—	18 7	16 1
Herefords— ,,	16 11	14 13	—	—
Devons— ,,	14 9	12 12	—	—
Store Sheep:—				
Hoggs, Hoggets, Tegs, and Lambs—	s. d.	s. d.	s. d.	s. d.
Downs or Longwools ...	42 2	35 4	—	—
Scotch Cross-breds ...	—	—	35 2	30 4
Store Pigs:—				
8 to 10 weeks old	22 10	18 4	25 7	21 1
12 to 16 weeks old	32 10	26 5	35 4	28 1

* Estimated carcass weight.

† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of April, 1911.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	Birmingham.	Liverpool.	London.	Manchester.	Edinburgh.	Glasgow.
		per cwt. *s. d.*	per cwt. *s. d.*	per cwt. *s. d.*	per cwt. *s. d.*	per cwt. *s. d.*	per cwt. *s. d.*
BEEF:—							
English	1st	55 6	55 0	56 6	55 6	56 0*	58 0*
	2nd	50 6	50 6	54 0	52 6	51 6*	56 0*
Cow and Bull ...	1st	49 0	46 0	47 0	49 0	47 6	49 6
	2nd	43 6	39 0	42 6	44 6	41 0	43 6
U.S.A. and Canadian:—							
Port Killed ...	1st	56 0	55 6	54 6	55 0	—	—
	2nd	52 6	50 6	52 0	53 0	—	52 6
Argentine Frozen—							
Hind Quarters...	1st	39 0	36 6	38 0	36 6	36 6	37 6
Fore ,, ...	1st	28 6	28 0	27 0	28 0	28 6	27 6
Argentine Chilled—							
Hind Quarters..	1st	41 0	41 0	42 6	41 6	40 0	43 0
Fore ,, ...	1st	29 6	29 0	28 6	30 6	29 6	30 6
Australian Frozen—							
Hind Quarters—	1st	36 6	—	38 0	33 6	—	34 6
Fore ,, ...	1st	28 0	—	27 0	25 6	—	26 0
VEAL:—							
British	1st	73 6	80 0	74 6	77 6	—	—
	2nd	64 0	74 0	64 0	72 6	—	—
Foreign	1st	—	71 6	73 6	69 6	76 6	—
MUTTON:—							
Scotch	1st	65 6	77 6	75 0	78 0	64 0	70 0
	2nd	56 0	71 6	63 6	73 6	53 0	57 0
English	1st	63 6	69 6	60 0	70 0	—	—
	2nd	56 0	61 0	55 6	61 0	—	—
Argentine Frozen ...	1st	28 6	29 0	28 6	29 0	27 6	28 6
Australian ,, ...	1st	27 6	27 0	26 6	27 0	—	27 0
New Zealand ,, ...	1st	—	—	32 0	—	—	29 6
LAMB:—							
British	1st	—	98 0	97 0	101 0	—	—
	2nd	97 0	86 6	86 6	88 6	—	—
New Zealand ...	1st	51 0	46 6	46 0	46 6	51 6	52 0
Australian	1st	39 0	34 6	37 0	34 6	37 6	38 6
Argentine	1st	39 0	38 0	37 6	38 0	36 0	38 6
PORK:—							
British	1st	70 0	65 6	66 6	67 0	60 6	63 6
	2nd	60 6	60 6	62 0	62 6	53 0	60 6
Foreign	1st	—	—	62 6	—	—	—

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1909, 1910 and 1911.

Weeks ended (*in* 1911).	WHEAT.						BARLEY.						OATS.					
	1909.		1910.		1911.		1909.		1910.		1911.		1909.		1910.		1911.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
Jan. 7 ...	32	9	33	6	30	5	26	11	24	11	23	11	17	5	17	2	17	0
„ 14 ...	32	8	33	8	30	8	27	1	24	11	23	10	17	5	17	7	17	2
„ 21 ...	33	2	33	9	30	11	27	3	24	11	24	4	17	8	17	6	17	4
„ 28 ...	33	0	33	6	30	11	27	6	25	0	24	5	17	9	17	4	17	3
Feb. 4 ...	33	4	33	7	30	9	27	7	24	10	24	5	17	10	17	7	17	5
„ 11 ...	33	8	33	4	30	5	27	8	24	9	24	6	17	11	17	11	17	5
„ 18 ...	34	1	33	0	30	3	27	11	24	6	24	7	18	0	18	0	17	6
„ 25 ...	34	5	32	7	30	2	28	0	24	2	24	9	18	0	17	10	17	7
Mar. 4 ...	34	10	32	7	30	0	27	11	24	6	25	0	18	2	18	1	17	5
„ 11 ...	35	8	32	6	30	1	28	4	24	1	25	0	18	2	18	0	17	5
„ 18 ...	35	9	32	6	30	1	28	0	23	6	24	11	18	5	18	0	17	6
„ 25 ...	36	0	32	9	30	2	28	0	23	7	25	0	18	6	17	11	17	5
Apl. 1 ...	36	5	33	0	30	3	27	10	23	8	24	11	18	8	18	0	17	5
„ 8 ...	37	4	33	6	30	4	28	0	23	1	24	7	18	10	17	11	17	7
„ 15 ...	38	7	33	7	30	3	27	8	23	5	25	2	19	2	18	3	18	3
„ 22 ...	41	4	33	7	30	4	28	2	23	0	25	5	19	9	18	3	17	10
„ 29 ...	42	5	33	0	30	11	27	10	22	10	25	5	20	0	18	3	18	3
May 6 ...	40	9	32	6	31	6	27	7	22	7	25	7	20	3	18	2	18	6
„ 13 ...	41	6	32	1			27	3	22	0			20	6	18	1		
„ 20 ...	42	8	31	10			27	0	21	8			20	11	17	8		
„ 27 ...	42	6	31	3			26	3	21	4			21	0	17	10		
June 3 ...	43	1	30	2			25	7	21	8			21	3	17	10		
„ 10 ...	42	11	29	1			26	10	20	9			21	4	17	10		
„ 17 ...	42	7	29	0			26	10	18	11			21	6	18	0		
„ 24 ...	42	8	29	4			27	2	20	1			21	7	17	9		
July 1 ...	42	9	29	9			27	2	19	11			21	9	17	7		
„ 8 ...	43	0	30	4			26	4	19	5			21	8	17	4		
„ 15 ...	43	3	31	1			26	10	21	3			21	9	17	7		
„ 22 ...	44	0	31	11			27	4	19	9			22	5	17	5		
„ 29 ...	43	5	33	5			24	6	20	10			22	2	18	1		
Aug. 5 ...	44	9	33	9			27	4	20	5			22	11	18	3		
„ 12 ...	44	9	33	5			24	9	20	4			21	8	18	0		
„ 19 ...	41	6	32	11			23	11	20	11			19	8	17	11		
„ 26 ...	38	5	32	7			24	7	20	10			19	4	17	2		
Sept. 2 ...	37	2	32	2			26	3	22	10			19	6	17	2		
„ 9 ...	34	11	31	11			26	1	23	3			18	5	17	2		
„ 16 ...	33	6	30	11			26	5	24	3			17	9	16	6		
„ 23 ...	32	9	30	2			26	8	24	2			17	7	16	3		
„ 30 ...	32	2	30	1			26	9	24	4			17	2	16	4		
Oct. 7 ...	31	8	30	1			26	9	24	7			17	0	16	3		
„ 14 ...	31	4	30	2			27	0	25	1			17	0	16	2		
„ 21 ...	31	8	30	4			27	7	25	3			16	11	16	1		
„ 28 ...	31	10	30	4			27	9	25	4			17	0	16	2		
Nov. 4 ...	32	5	30	4			27	9	25	6			17	0	16	2		
„ 11 ...	32	5	29	11			27	7	25	4			17	1	15	11		
„ 18 ...	32	7	29	8			27	0	25	1			17	4	16	1		
„ 25 ...	33	0	29	11			26	8	24	10			17	3	16	4		
Dec. 2 ...	33	3	30	6			26	1	24	7			17	4	16	7		
„ 9 ...	33	3	30	9			25	7	24	3			17	3	16	9		
„ 16 ...	33	2	30	7			25	3	23	9			17	4	16	10		
„ 23 ...	33	1	30	7			25	2	23	10			17	4	16	9		
„ 30 ...	33	3	30	5			25	1	23	9			17	4	16	9		

NOTE.—*Returns of purchases by weight or weighed measure are converted to Imperial Bushels at the following rates:* Wheat, 60 lb.; Barley, 50 lb.; Oats, 39 lb. per Imperial Bushel.

AVERAGE PRICES of Wheat, Barley, and Oats per Imperial Quarter in FRANCE, BELGIUM, and GERMANY, and at PARIS, BERLIN, and BRESLAU.

—		Wheat. 1910.	Wheat. 1911.	Barley. 1910.	Barley. 1911.	Oats. 1910.	Oats. 1911.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France:	March	41 11	46 5	25 11	26 8	21 10	21 11
	April	42 2	45 11	25 11	26 6	21 10	21 11
Paris:	March	43 1	47 0	24 8	24 8	21 6	22 8
	April	43 0	46 1	24 8	24 8	22 1	23 4
Belgium:	February	36 7	31 4	23 6	24 1	19 7	19 2
	March	35 10	32 5	23 10	24 7	19 8	19 8
Germany:	February	45 11	40 9	25 10	28 4	21 6	21 9
	March	45 7	40 6	25 9	29 0	21 3	22 3
Berlin:	February	48 9	42 7	—	—	23 1	21 4
	March	48 0	42 6	—	—	22 5	21 8
Breslau:	February	45 7	38 1	25 4* / 24 2†	27 7* / 22 11†	20 6	19 10
	March	44 8	37 10	25 4* / 24 2†	27 7* / 22 11†	19 11	20 1

* Brewing. † Other.

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the German quotations are taken from the *Deutscher Reichsanzeiger*, the prices for the German Empire representing the average of the prices at a number of markets.

AVERAGE PRICES of British Wheat, Barley, and Oats at certain Markets during the Month of April, 1910 and 1911.

—	Wheat. 1910.	Wheat. 1911.	Barley. 1910.	Barley. 1911.	Oats. 1910.	Oats. 1911.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London...	34 1	31 9	22 5	24 1	18 5	18 9
Norwich	33 1	30 6	23 4	24 11	17 9	17 9
Peterborough	32 7	29 11	21 5	24 10	17 11	17 7
Lincoln...	33 0	29 11	20 9	25 9	18 4	17 10
Doncaster	33 0	29 9	23 0	24 10	18 4	17 6
Salisbury	33 9	30 1	23 5	23 9	17 9	17 1

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND in the Month of April, 1911.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Bristol. First Quality.	Bristol. Second Quality.	Liverpool. First Quality.	Liverpool. Second Quality.	London. First Quality.	London. Second Quality.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British	14 0	13 0	—	—	13 9	12 0
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish Creamery ...	—	—	103 6	101 0	108 0	—
,, Factory ...	—	—	94 6	86 6	94 0	88 0
Danish	—	—	117 6	115 6	118 0	116 0
French	—	—	—	—	122 0	116 0
Russian	102 6	99 0	102 0	96 0	102 6	99 6
Australian	104 0	100 0	102 0	98 0	106 0	102 0
New Zealand ...	110 0	106 0	110 6	107 0	109 6	105 6
Argentine	—	—	100 0	98 0	102 0	99 0
CHEESE :—						
British—						
Cheddar	76 0	70 0	74 0	70 0	79 0	74 0
			120 lb.	120 lb.	120 lb.	120 lb.
Cheshire	—	—	70 0	64 0	82 6	78 0
			per cwt.	per cwt.	per cwt.	per cwt.
Canadian	64 0	62 0	64 0	62 0	64 6	63 6
BACON :—						
Irish	68 6	64 6	68 0	62 0	71 0	66 6
Canadian	59 0	56 6	57 6	53 0	59 6	57 0
HAMS :—						
Cumberland	—	—	—	—	108 6	100 6
Irish	—	—	—	—	106 6	100 0
American (long cut)	59 6	53 6	57 0	0	62 0	57 0
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British	8 9	—	—	—	9 4	8 6
Irish	8 3	7 9	8 3	7 5	8 5	7 1
Danish	—	—	9 0	8 6	9 4	7 7
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Langworthy	111 0	93 6	96 6	90 0	121 0	111 0
Scottish Triumph ...	108 6	95 0	96 6	90 0	112 6	105 0
Up-to-Date	108 6	93 6	96 6	90 0	112 0	102 6
HAY :—						
Clover	90 0	75 0	95 0	70 0	100 0	83 6
Meadow	77 6	60 0	—	—	89 0	66 6

DISEASES OF ANIMALS ACTS, 1894 to 1910.

NUMBER OF OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

Disease.	April.		Four Months ended April.	
	1911.	1910.	1911.	1910.
Swine-Fever:—				
Outbreaks	242	84	755	381
Swine Slaughtered as diseased or exposed to infection ...	2,238	822	7,969	3,032
Anthrax:—				
Outbreaks*	82	117	343	522
Animals attacked	98	147	398	645
Foot-and-Mouth Disease:—				
Outbreaks	—	—	1	—
Animals attacked	—	—	18	—
Glanders (including Farcy):—				
Outbreaks	19	31	71	124
Animals attacked	31	53	214	312
Sheep-Scab:—				
Outbreaks	12	18	287	301

* For 1910 the figures show the outbreaks reported, but for 1911 the outbreaks confirmed.

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

Disease.	April.		Four Months ended April.	
	1911.	1910.	1911.	1910.
Swine-Fever:—				
Outbreaks	10	18	45	29
Swine Slaughtered as diseased or exposed to infection ...	133	388	799	685
Anthrax:—				
Outbreaks	—	—	3	4
Animals attacked	—	—	3	6
Glanders (including Farcy):—				
Outbreaks	—	1	1	1
Animals attacked	1	2	2	2
Sheep-Scab:—				

SELECTED CONTENTS OF PERIODICALS.

Agriculture, General and Miscellaneous—

Über die Bedeutung der Bodenkarten für Bodenkunde und Landwirtschaft, *Dr. E. Blanck*. (Fühling's Land. Ztg., February 15th, 1911.) [B. 40–1.]

Breeding Problems in the Plant World, *J. H. Priestley*. [B. 17.] The Pollen of Flowers, *S. Leonard Bastin*. [B. 16–5.] The Farmer's Interest in Seeds, *Donald McDonald*. [B. 18.] (Jour. Bath and West and S.C. Soc., Vol. V., Fifth Series, 1910–11.)

Versuche über die Impfung von Leguminosen mit Knöllchenbakterien, *Drs. Gerlach* and *Vogel*. (Mitt. K. Wilhelms Inst. Landw. Bromberg, Band I., Heft 2.) [B. 28–5.]

Field Crops—

Bericht über die Anbauversuche der Deutschen Kartoffel-Kultur-Station im Jahre 1910, *Dr. C. von Eckenbrecher*. (Ztschr. Spiritusindus., Ergänzungsheft, 1911.) [C. 26–3.]

Beet Sugar: Can it be made profitably in Great Britain? *F. J. Lloyd*. Trans. Surv. Inst., Vol. XLIII., Part VII., 1911.) [C. 34–5.]

Beet Sugar and Sugar Beet, *C. Kains-Jackson*. (Jour. Bath and West and S.C. Soc., Vol. V., Fifth Series, 1910–11.) [C. 34–3.]

Some Aspects of the International Wheat Trade, *J. H. Hubback*. (Econ. Jour., March, 1911.) [C. 2–3.]

Water Meadows in South Wiltshire and How they Affect the Farms they Adjoin, *G. R. Kendle*. (Jour. Land Agents' Soc., April, 1911.) [C. 42–1.] [M. 8.]

Die Verbesserung unserer Wiesenmoore, *C. Luedecke*. (Fühling's Landw. Ztg., April 1st, 1911.) [B. 52.]

Live Stock—

Cows for Draught Purposes, *J. Wrightson*. [F. 66–1.] Feeding Experiments with Soya Bean Cake, *C. T. Gimingham*. [F. 74–5; C. 44–5.] (Jour. Bath and West and S.C. Soc., Vol. V., Fifth Series, 1910–11.)

Ueber die Giftigkeit der Rizinussamen—Mit Rizinussamen verfälschte Erdnussmehle, *Dr. Miessner*. (Mitt. K. Wilhelms Inst. Landw. Bromberg, Band I., Heft 3.) [F. 74–3.]

Fütterungsversuche mit getrockneten Kartoffeln, *Dr. Gerlach*. (Mitt. K. Wilhelms Inst. Landw. Bromberg, Band I., Heft 2.) [F. 74–3; C. 26–7.]

Dairying and Food, General—

The Coagulation of Condensed Milk, *R. Greig-Smith*. (Proc. Linn. Soc., N.S. Wales, 1909, Part I.) [G. 56–1.]

The Manufacture of Stilton and Wensleydale Cheese, *John Benson*. [G. 66–3.] Report of the Investigation into the Cellular Elements Present in Milk. Part II.:—Quantitative and Qualitative Results. Part III.:—The Milk of Animals other than the Cow, *R. T. Hewlett, S. Villar*, and *C. Revis*. [G. 56–3; H. 36–1.] (Jour. Brit. Dairy Farmers' Assoc., Vol. XXXV., 1911.)

Weitere Untersuchungen über den Einfluss von Reizstoffen auf die Milchsekretion, *G. Fingerling*. Uber den Einfluss verschiedener wässriger Futtermittel auf die Menge und Zusammensetzung der Milch, *F. Tangl* and *A. Zaitschek*. Uber den Einfluss der Futtermittel auf die Zusammensetzung des Milchfettes, *A. Zaitschek*. (Landw. Vers. Stat., Vol. LXXIV., 1911, Heft III.–V.) [G. 50–7.]

Bakteriologische Studien über dänische Butter, *O. Jensen*. (Centbl. Bakt. [&c.], Band 29, No. 23–25, 1911.) [G. 54–3; G. 60–3.]

Untersuchungen über die Wirkung von Palmkernkuchen auf die Milchproduktion, *Dr. O. Kellner*. (Mitt. Deut. Landw. Gesell., April 15th, 1911.) [G. 50–7.]

Veterinary Science—

Die Behandlung und Bekämpfung der Maul- und Klauenseuche, *Prof. Eggeling.* (Mitt. Deut. Landw. Gesell., March 18th, 1911.) [H. 36-9.]

Die Bradsot der Schafe, *Dr. Miessner.* [Mitt. K. Wilhelms Inst. Landw Bromberg, Band I., Heft 3.] [H. 42-7.]

Forestry—

The Beechwood Industry of the Chilterns, *W. Dallimore.* (Kew Bulletin, No. 2, 1911.) [L. 28-1.]

La Conservation des Bois dans les Constructions. Chapitre I.:—La Chimie du Bois Sain, *C. Malenkovic.* (Ann. Sci. Agron., Mars, 1911.) [L. 28-3.]

Engineering—

Experiments with "Waterfinders," *Prof. J. Wertheimer.* (Jour. Roy. Soc. Arts, February 24th, 1911.) [M. 10.]

Economics—

Prix officiels des céréales, &c., produites en 1910. (Denmark, Commun. Statistiques, Tome XXXV., Livr. V.) [N. 34-1.] (This report gives the prices of agricultural produce in Denmark for the year 1910, with averages for previous years.)

ADDITIONS TO THE LIBRARY.

[NOTE.—*The receipt of annual* publications of foreign agricultural and other departments, experiment stations and societies is not noted in the monthly list of additions to the Library. A list of these publications appeared in the *Journal* for October, November, and December, 1909.]

Agriculture, General and Miscellaneous—

U.S. Dept. of Agriculture, Bureau of Plant Industry.—Circ. No. 73:—The Distinguishing Characters of the Seeds of Quack-Grass and of Certain Wheat-Grasses. (9 pp.) [B. 20-3.] Bull. No. 202:—The Seedling-Inarch and Nurse-Plant Methods of Propagation. (43 pp. and plates.) [B. 17.] *Washington, 1911.*

U.S. Dept. of Agriculture, Bureau of Soils.—Bull. No. 75:—Lawn Soils. (55 pp.) [B. 40-1.] Bull. No. 76:—A Review of the Phosphate Fields of Florida. (23 pp.) [B. 30.] Washington, 1911.

New South Wales, Dept. of Agriculture.—Farmers' Bull. No. 43:—Book-keeping for Farmers. (20 pp.) *Sydney, 1910.* [B. 50.]

Public Accounts Committee.—Copy of Epitome of the Reports from the Committees of Public Accounts, 1857 to 1910, and of the Treasury Minutes thereon, with an Index. (572 pp.) London: Wyman and Sons, Ltd., 1911. 2*s.* 3*d.* [A. 2-1.]

Departmental Committee upon the Work of the Congested Districts (Scotland) Commissioners for the Improvement of Live Stock and Agriculture.—Minutes of Evidence and Index. [Cd. 5509.] (133 pp.) London: Wyman and Sons, 1911. 1*s.* 2*d.* [A. 12; F. 2.]

Johnson, S. W.—How Crops Grow: a Treatise on the Chemical Composition, Structure, and Life of the Plant. (416 pp.) New York: Orange Judd Co., 1908. 7*s.* 6*d.* [B. 16-3.]

United States.—An Act making Appropriations for the Dept. of Agriculture for the Fiscal Year ending June thirtieth, nineteen hundred and twelve. (34 pp.) Washington, 1911. [A. 80.]

Colonial Reports—Miscellaneous, No. 75.—The Imperial Department of Agriculture in the West Indies. [Cd. 5515.] (16 pp.) London: Wyman

Bengal, Dept. of Agriculture.—Departmental Records, No. 1, 1910:—Some Suggestions as to the Organisation of Agricultural Exhibitions in Bengal. (28 pp. and plates.) Calcutta: Bengal Secretariat Press, 1910. [A. 60.]

West of Scotland Agricultural College.—Bull. No. 55:—Reports on Experiments (*a*) On the Best Method of Applying Lime to Arable Land, and (*b*) On the Relative Economy of Ground and Slaked Lime, conducted in the Years 1902–9. (195–221 pp.) Glasgow, 1911. [B. 24–5.]

Wood, T. B.—A Course of Practical Work in Agricultural Chemistry for Senior Students. (56 pp.) Cambridge: University Press, 1911. 2*s.* 6*d.* net. [B. 22–5.]

South Australia, Intelligence Dept.—Special Intelligence Bull. No. 17:—Report on Recent Development in Economic Geology. (20 pp.) Adelaide, 1910. [B. 36.]

Deutsche Landwirtschafts-Gesellschaft.—Arbeiten. Heft 178:—Die Entstehung der Seemarschen. (49 pp.) [B. 56.] Heft 179:—Eine Studienfahrt durch Schleswig-Holstein, 1910. (62 pp.) [A. 28.] Berlin: Paul Parey, 1911.

Brenchley, W. E.—The Weeds of Arable Land in Relation to the Soils on which they Grow. [Annals of Botany, Vol. XXV., No. XCVII., January, 1911.] (155–165 pp.) 1911. [B. 20–3.]

Seymour, A. H.—Report to the Governor on the Possibilities of Agricultural Development in Newfoundland, 1909. (32 pp.) St. Johns, N.F., 1910. [A. 74.]

U.S. Dept. of Agriculture, Office of Experiment Stations.—Circ. No. 109:—Agricultural Fair Associations and their Utilisation in Agricultural Education and Improvement. (23 pp.) Washington, 1911. [A. 80; B. 44–17.]

U.S. Dept. of Agriculture, Bureau of Chemistry.—Circ. No. 69:—Improvements in the Knorr Fat Extraction Apparatus. (4 pp.) Washington, 1911. [B. 22–5.]

Johannsen, W.—Elemente der Exakten Erblichkeitslehre. (516 pp.) Jena: Gustav Fischer, 1909. [B. 17.]

Lancaster County Council, Agricultural Dept.—Farmers' Bull. No. 20:—Report of Experiments with Nitrogenous Manures. (10 pp.) Preston, 1911. [B. 28–1.]

Haggard, H. Rider.—Rural Denmark and its Lessons. (335 pp.) London: Longmans, Green and Co., 1911. 6*s.* 6*d.* net. [A. 36; N. 4–7.]

U.S. Dept. of Agriculture.—Farmers' Bull. No. 432:—How a City Family Managed a Farm. (28 pp.) Washington, 1911. [A. 80.]

Priestley, J. H.—Electricity as a Factor in Crop Production. (37–54 pp.) [Journal of the Farmers' Club, April, 1911.] [B. 34.]

Schnell, Dr.—Zur Vergangenheit und Zukunft der Landschule. (343–395 pp.) [Landarbeit und Kleinbesitz, Heft 11.] Berlin: Paul Parey, 1911. [B. 44–3.]

Field Crops—

Midland Agricultural and Dairy College.—Bull. No. 1, 1910–11:—Manuring for Milk, a second interim Report on an experiment commenced in April, 1909 and continued in 1910. (7 pp.) [C. 42–9.] Bull. No. 2, 1910–11:—Report on Field Trials on the Manuring of Seeds Hay (Rye Grass and Clover, One Year's Ley.) (8–15 pp.) [C. 42–9.] Bull. No. 3, 1910–11:—Results of Field Trials on the Manuring of Potatoes in 1910. (16–22 pp.) [C. 26–5.] Bull. No. 4, 1910–11:—Report on Field Trials on the Manuring of Mangels in the Year 1910. (23–26 pp.) [C. 32.] Bull. No. 5, 1910–11:—Report on Field Trials with Varieties of Mangels. (27–34 pp.) [C. 32.] Bull. No. 6, 1910–11:—Report on Field Trials with Varieties of Swedes. (35–41 pp.) [C. 32.] Bull. No. 7, 1910–11:—Results of Field Trials on the Manuring of Swedes. (43–47 pp.) [C. 32.] Kingston, Derby, 1911.

Finance (1909–10) Act, 1910.—Copy of Regulations in relation to Tobacco grown in the United Kingdom. (8 pp.) London: Wyman and Sons, 1911. 1*d.* [C. 54.]

University College of N. Wales, Bangor, Agricultural Department.—Bull. No. II.:—Mixtures of Grass and Clover Seeds (Sown 1906), 1910. (8 pp.) [C. 42–1.] Bull. No. III.:—Experiment on the Manuring of Grass Land at Quirt, Dwyran, 1910. [C. 42–9.] Bull. No. IV.:—Mixtures of Grass and Clover Seeds (Sown 1909), 1910. (6 pp.) [C. 42–1.] Bangor, 1911.

Ireland, Dept. of Agriculture and Technical Instruction.—Departmental Committee on the Irish Flax-Growing Industry, Minutes of Evidence, Appendices and Index. [Cd. 5503.] (505 pp.) London: Wyman and Sons, 1911. 4*s.* 1*d.* [C. 48.]

New South Wales, Dept. of Agriculture.—Farmers' Bull. No. 36:—Sorghum. (19 pp.) [C. 34–9.] No. 37:—Lucerne. (118 pp.) [C. 44–3.] No. 41:—Varieties of Wheat Recommended by the Dept. of Agriculture. (24 pp.) [C. 2–1.] Sydney, 1910.

New York Agricultural Experiment Station.—Bull. No. 327:—Potato Fertilisers: Method of Application and Form of Nitrogen. (281–304 pp.) Geneva, New York, 1910. [C. 26–5.]

Kentucky Agricultural Experiment Station.—Bull. No. 149:—Bleached Flour. (65–124 pp.) Lexington, Kentucky, 1910. [C. 4; G. 73.]

Purdue University Agricultural Experiment Station.—Circ. No. 23:—How to Grow More and Better Wheat. (40 pp.) Lafayette, Indiana, 1910. [C. 2–1.]

West of Scotland Agricultural College.—Bull. No. 56:—Reports on Experiments (*a*) On the Best Seed of Potato Oats. (223–229 pp.) Glasgow, 1911. [C. 16.]

U.S. Dept. of Agriculture.—Farmers' Bull. No. 414:—Corn Cultivation. (32 pp.) 1910. [C. 20.] No. 424:—Oats: Growing the Crop. (44 pp.) 1910. [C. 16.] No. 429:—Industrial Alcohol: Sources and Manufacture. (32 pp.) 1911. [C. 28.] Washington.

U.S. Dept. of Agriculture, Bureau of Plant Industry.—Circ. No. 74:—The Sulphur Bleaching of Commercial Oats and Barley. (13 pp.) [C. 8; C. 16.]

Lancaster County Council, Agricultural Dept.—Farmers' Bull. No. 18:—Report of Field Trials with Varieties of Oats. (7 pp. and chart.) [C. 16.] No. 19:—Report of Field Trials on the Manuring of Mangels, 1907–10. (8 pp. and chart.) [C. 32.] Preston, 1911.

North Dakota Agricultural Experiment Station.—Bull. No. 89:—Wheat Investigations; Milling, Baking, and Chemical Tests. (80 pp.) Fargo, North Dakota, 1910. [C. 2–1.]

Horticulture—

U.S. Dept. of Agriculture, Bureau of Plant Industry.—Bull. No. 193:—Experiments in Blueberry Culture. (100 pp.) [D. 37.] Bull. No. 194:—Summer Apples in the Middle Atlantic States. (96 pp. and plates.) [D. 6.] Washington, 1910.

U.S. Dept. of Agriculture, Bureau of Chemistry.—Circ. No. 68:—Tomato Ketchup under the Microscope: with Practical Suggestions to Ensure a Cleanly Product. (14 pp.) Washington, 1911. [D. 38–1; G. 72.]

Quinn, G.—Fruit Tree Pruning, a Practical Text-book for Fruitgrowers Working under the Climatic and Economic Conditions Prevailing in Temperate Australia. (230 pp.) Adelaide: Government Printer, 1910. 1*s.* 3*d.* [D. 28–5.]

[Books may be borrowed from the Board's Library on certain conditions, which may be ascertained on application. The volumes marked * are not available for lending.]

THE JOURNAL

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THE "KINGSTON" CHEESE.

A CHEESE FOR SMALL-HOLDERS AND OTHERS.

ALEC. TODD AND WILFRID SADLER.

Midland Agricultural and Dairy College, Kingston, Derby.

MERCHANTS of dairy produce have frequently asked makers to produce small Cheshires or Leicesters, varying from 1 to 2 lb. in weight, because they have known that the right article of such a size would meet with a ready sale, provided the quality could be relied upon.

The chief difficulty hitherto experienced has been that practically all attempts to reproduce in miniature such cheeses as Cheddar, Cheshire, Leicester, or Derby, have resulted in a cheese having a thick rind, thus causing much waste when cut up, and also one which failed to ripen properly, due to the fact that it dried up and became hard and chalky in texture, with little or no flavour.

In many cases the processes of manufacture and treatment have been identical with those adopted in the make of the larger cheeses, except that on the curd being ready for grinding small moulds of the required size have been substituted for the usual larger ones.

Naturally, the results have been unsatisfactory. After much preliminary experimental work, we have been able to devise a system which, if carefully followed, will produce a small cheese varying in weight from 1 to 2 lb., which embraces the qualities of a hard-pressed variety, and yet which is ripe and ready for consumption ten days after making.

In placing before the public a description of the "*Kingston*" *cheese, and the methods adopted in its manufacture*, we have in view three main objects :—

Firstly, to point out that it supplies a demand for a cheese of a size suitable for the table of the average householder; *one which, as regards early maturity and the incorporation of* moisture bears some relation to certain classes of soft cheese, *while at the same time it possesses the distinctive quality of* a typical ripened hard-pressed cheese with respect to flavour and texture.

Secondly, the utensils required and the accommodation necessary for the making and ripening do not require to be considerable, and makers of small means and limited space can attain quite satisfactory results.

Thirdly, it should be a particularly suitable cheese for small-holders to make. The amount of milk required would not necessitate the keeping of many cows, and the fact that the ripening process is rapid means little loss of weight during ripening, and also provides for a quick return financially; while the actual time involved during the process of making is comparatively small.

The illustration on page 195 will give a general idea of the shape and size of the cheese. While it has a flavour essentially its own, the texture may be described as soft and granular, embodying the salient features of a typical Cheshire and Leicester, while to the touch it is rich and buttery; when bored with a "trier" the fatty, smeary appearance on the back of the iron is such as is usually found only in a ripe old mellow cheese.

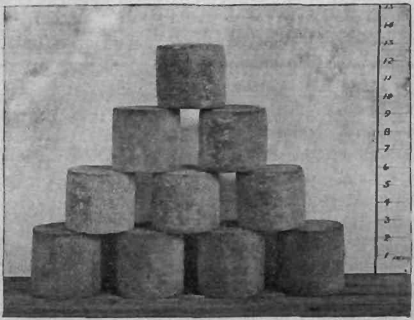
If the top surface of a mature cheese be gently pressed with the thumb in the manner so well known to those in the trade, a perceptible break in the surface round the edge of the thumb will be noticed, showing the delicate and fragile nature of the texture.

Accommodation and Utensils.—Two rooms are necessary, one as the making- and press-room, and another to serve as the ripening-room. A suitable size for the former is 12 ft. square, and for the latter about 7 ft. square. It would be possible to manage with one room only, but the great disadvantage would be that on the windows being opened

at the end of the day's work, cheeses which had previously been made would be chilled and the ripening process affected.

During the night a cheese-making room should, in summer, be fully opened to the air, the atmosphere being sweetened thereby and the temperature lowered.

It is equally important that the room in which the cheeses are ripened should be kept at an even temperature; obviously if one room only be available, the best results cannot well be expected. Each room should be ventilated in a thorough manner, and both ventilators and windows be made to open and close with ease.



PYRAMID OF KINGSTON CHEESES.

Throughout the process of making it is desirable to have the room at a temperature of about 60° F.; if, however, such a temperature can be obtained only by keeping windows, door, and ventilators continually closed, this point must be waived.

A very practical means of securing the required temperature in the ripening-room, at a minimum cost, is to have this room arranged on the other side of the wall from, say, the kitchen fireplace; this is not intended for general application, but in this particular case.

We have found that in order to secure the necessary quick ripening the room must be at a temperature somewhat higher

than is usually the rule; a temperature of 60° F. to 65° F. is satisfactory, and the disadvantages often experienced in ripening larger cheeses at a fairly high temperature have not been met with.

In the making-room, shelves are required for the various smaller utensils, and also, should it be necessary, for one day's cheeses, previously to their being taken from the mould; a table or bench is also needed on which to turn and bandage the cheeses.

In the ripening-room, provision should be made by means of "sparred" shelves for the accommodation of about fourteen days' cheeses, the shelves to be sufficiently wide for one cheese; we have found that by using sparred shelves a much freer circulation of air is obtained, a fact which materially assists in obtaining the desired ripening.

It is immaterial whether the shelves are arranged round the walls or in the centre of the room, provided proper ventilation is obtained.

In addition to the accommodation above noted, a small outhouse near at hand would be an advantage, as a boiler or copper could be fixed therein.

A sure supply of hot water is essential, and if no room is available, a portable copper can be bought at a small cost, and can be fixed just outside the dairy or moved about at will.

As regards the utensils, some initial expense is inevitable; it is, of course, possible to make good cheese by the aid of very primitive appliances, but we are strongly of opinion that for the purpose we have in view it is preferable, and in the end much more economical, to obtain as far as possible up-to-date utensils of a suitable and convenient nature.

However careful and systematic the maker may be, it is not an easy matter to produce an article of uniform quality throughout, and as uniformity is one of the essentials to successful dairying, any mechanical assistance to the attainment of this end should be warmly welcomed, even if for the time being some extra expenditure is entailed.

Any of the principal dairy-utensil manufacturers can supply what is required, though the prices given below may vary to some extent.

Metal Vat, with wooden rack and suitable stand, sufficiently large to enable the maker to deal with 12 gallons of milk, £2 10s.

Two Small American Knives, one vertical and one horizontal, the blades of the former being about ⅜ in. apart and the latter ½ in.; when ordering these the size of the vat should be borne in mind, and the knives be obtained of such width as will ensure them cutting the curd without any "overlapping," so avoiding variation in the size of the pieces of curd.

Curd Mill, with double tinned iron rollers, such as used for the grinding of Cheshire curd, £2 15s. In order to maintain the typical nature of the cheese it is necessary that before moulding the curd shall be ground to a very fine state, a condition which cannot well be obtained by breaking with the hands.

Press.—Double level single press, sufficient to give 1½ cwt. pressure dead weight, £2 10s. As the cheeses only require a few hours' pressure, one press is quite sufficient, and will be available for each successive day's make. This appliance we consider is of great importance if the cheese is to be secured true to type; we have tried many methods of pressing, but find that varying weights direct on each cheese singly, are not satisfactory, inasmuch as the cheese dries and fails to form a coat, while instead of ripening quickly, it becomes chalky and tasteless.

Moulds.—These are made in well-tinned metal, and a sufficient number should be obtained for two days' make of cheese. The size will, of course, vary according as the cheeses made are approximately 1, 1½, or 2 lb. in weight; the following measurements are suitable, where the cheeses are to be about 1 lb. weight, and other moulds should be in respective proportions:—Height 4 in., and diameter 3½ in., the bottom of the mould being closed except for a hole in the centre 1½ in. diameter. A loose tin follower is used in the bottom and a wooden follower 1 in. thick is needed to cover the curd at the top.

In addition to the above, there will be required a thermometer, measuring glasses, cheese cloth, bandaging cloth, and the usual supply of buckets, brushes, ladles, scoops, &c.

It is generally understood that in establishing a cheese-making dairy of, say 40 cows, the outlay for utensils averages about £2 per cow. It will be seen that the total outfit we recommend can be obtained for less than £10, thus keeping well within range, even if the cheesemaker has but four or five cows.

Method of Manufacture.—In the making of this, as in all cheeses, the first essential is clean, wholesome milk, free from taint, *i.e.* any undesirable odour or flavour, and untreated by chemicals and extremes of heat or cold. The "Kingston" cheese is made from mixed milk, equal parts of the morning's and evening's milking.

The evening's milk having been brought into the dairy properly strained and filtered, is poured into the vat, and by means of cold water in the jacket of the vat the temperature is reduced.

It is well known that taints are due almost entirely to the growth of certain micro-organisms, and further that such taint producers flourish at a fairly high temperature, or at one fairly low. The type of organism required by the cheese-maker is that which produces lactic acid and no taints, and it is therefore necessary to have the milk during the night at such a temperature as will be favourable to these bacteria, rather than to those already mentioned.

The jacket of the vat having been filled with cold water, the milk is gently stirred at intervals in order to equalise the temperature and also to assist in getting rid of that odour, too often present, known as a "cowy" odour.

If the first supply of water is not sufficient, this should be run out and the jacket refilled; care being taken, however, that when the vat is left for the night the water in the jacket is about the same temperature as the milk itself, or the cream will rapidly rise.

A wooden rack is placed over the vat, and covered with clean cheese-cloth or muslin until morning; to use a lid for this purpose is a mistake, as it prevents free access of air.

The following morning the cream is skimmed off, warmed in a pan over a copper, and poured back into the vat with the morning's milk: the slight heating assists in the mixing of the night's cream with the milk.

In the making of any quick ripening hard-pressed cheese, an appreciable amount of acidity must be developed in the milk before the rennet is added. From the practice of adding some agent to "start" the acidity in milk for cheese-making we derive the term "starter," which may be defined as follows:—"A starter is a growth or culture of those bacteria which best bring about the required amount of the right kind of acidity, and also the desired flavour; such culture when once obtained being kept pure."

Except in special circumstances, it is more satisfactory to use a pure or commercial starter. Its propagation and use are matters of great moment, and full particulars and instructions relative to these points are given in a leaflet prepared for the use of farmers and dairymen by one of us (Alec Todd) and issued from the College.

The starter should be strained into the vat through a fine

sieve or muslin when the first morning's milk is added, at the rate of about ½ per cent. (or approximately ½ pint to 10–12 gallons).

The temperature of the milk is now raised to 84° F. by means of hot water in the jacket, the milk meanwhile being frequently stirred to mix the starter, and to bring about a uniform temperature.

The cheese may be made either white or coloured; we have usually made the latter, and if this be done the annatto should always be added and well stirred in at least ten minutes before renneting: one dram of annatto to four or five gallons of milk gives a suitable colour, and on being added it should always be diluted with water or milk to insure a more perfect mixing. One of the fundamentals which must be attended to if a uniform quality of cheese is to be assured, is to have practically the same amount of acidity present in the milk each day at the stage when the rennet is added: the most satisfactory method of estimating this is by means of a "Rennet Test," which consists in determining the amount of acidity present according to the length of time taken for a given quantity of rennet to coagulate a given quantity of milk at a definite temperature. The apparatus required includes a measuring glass graduated in fluid ounces, to hold four ounces, a smaller glass measuring one dram, a thermometer, and a stop-watch—or a watch which is clearly marked in seconds.

In making the test, four ounces of well-mixed milk out of the vat are taken, exactly one dram or 3½ c.cs. rennet are measured into a cup, and three or four short pieces of hay or straw, say ¼ inch long, are put in to act as indicators. The test is always conducted at 84° F., whatever the type of cheese, without regard to the season of the year. A thermometer is placed in the milk, and in order to bring both milk and rennet to the required temperature, a bowl or small tub should be at hand containing water about 90–95° F. The temperature obtained, a thermometer is placed in the rennet cup, the milk poured in, and stirring with the thermometer commences simultaneously; the time by the second hand of the watch is noted. Having stirred for fifteen seconds, the thermometer, which should still register 84° F., is taken out,

and immediately the straws stop the time must be noted. This is the point of coagulation, and the number of seconds elapsing from the time the milk comes in contact with the rennet until the straws stop is taken as the rennet test. We have found that a test of twenty-five seconds is suitable as an average, but the actual test must be decided by individual makers on account of variation in milks and changes of season.

On no account should the milk be renneted before sufficient acid is present, or the process of manufacture will be lengthened to the detriment of the cheese; while, on the other hand, if the renneting be delayed after a suitable test has been obtained, a quick over-acid cheese is the result. When the temperature and rennet test are satisfactory, the rennet is added at the rate of one dram to 2½ gallons of milk, after having previously diluted it with six times its volume of water to facilitate the mixing with the milk, the whole is thoroughly stirred for five minutes, and then the surface of the milk gently stirred until the rennet shows effect. If the operation is continued beyond this stage the milk is "over-stirred," with consequent loss of fat and deterioration of quality in the cheese.

The vat is covered with a lid and the contents left until set or until coagulation is complete: this should be about forty to forty-five minutes from the time the rennet was added.

When sufficiently firm, a state at which the coagulum should break clean over the finger, cutting takes place. This is accomplished by cutting lengthwise and across with the vertical knife, and lengthwise with the horizontal knife, thus leaving the sections of curd about half an inch by a quarter of an inch. The operation must be most carefully carried out, as an even cutting enables the maker to scald evenly, and also assists considerably in a uniform expulsion of the whey. If an acidimeter be used the acid test at this stage should be ·12 to ·13 per cent. The advantages of including this apparatus, which is inexpensive, in the fitting up of a dairy are many, and the writers will be very glad to supply to any reader on application full information relating to its uses. After cutting, the curd remaining on the bottom and sides of the vat is loosened, and the whole gently stirred for ten to

fifteen minutes in order to separate the pieces of curd; at the same time a thin film forms around each particle, thus preventing to a great extent loss of fat.

The process of scalding, cooking, or heating then commences, which consists in gradually bringing the contents of the vat uniformly to a suitable temperature, that most satisfactory being 88° to 90° F. Hot water is poured into the jacket of the vat, and the stirring carefully continued as before. Renewal of the water is necessary, and the final temperature should be attained in twenty minutes.

The objects of the heating are:—

1. To firm-up the curd.
2. To expel the moisture gradually and uniformly.
3. To assist in the development of acidity.

When the "scald" temperature is reached, stirring is continued until a suitable firmness is obtained, when the curd is ready to pitch, that is, to be allowed to settle at the bottom of the vat. This is a condition almost impossible to appreciate except by practical demonstration and experience, but usually the time taken from commencing to stir until pitching is 1¼ to 1½ hours; the curd should not be mushy, while if a particle be split it should be of an even consistency and no free whey apparent. A period of twenty to thirty minutes is sufficient for the curd to lie in the whey, but before running off the latter a test should be made on a hot iron, and if convenient, with the acidimeter.

To perform the hot-iron test a little curd is squeezed in the hand until sufficiently pressed to hold firmly together and then applied to an iron—a plain file is suitable—heated to a black heat, in such a manner that if there is acidity in the curd, it—the curd—will draw away in fine silky threads. If the threads on the iron are one-eighth of an inch long the whey is drawn; at the same stage some whey squeezed from the curd and tested with the acidimeter shows ·15–·16 per cent. acidity.

The drawing of the whey is one of the most important stages in the whole process of making, and it is essential that there should be the right degree of acidity present; if not sufficient, the curd will be soft and retain too much moisture, resulting in a "sweet" or "weak" cheese. If too much

acidity is present, an "over-acid" curd will be obtained, producing a hard, dry cheese.

In commencing this operation the curd is drawn up to the end of the vat away from the tap, and slight pressure applied to assist in the expulsion of the whey. When this is complete the pressure is taken off and the curd cut into four-inch cubes, and taken out into a cloth on a rack, each cube of curd being turned in so doing.

The rack is placed back in the vat, the curd covered up well with cloths, and left for fifteen minutes. Again, the curd is cut into similar cubes, turned in bulk, and each cube broken into halves; this assists materially in getting rid of the whey, and has considerable influence on the short texture so much required in the final product. It is again covered up and left for an interval of fifteen to twenty minutes. During this time the acidity is gradually developing, and this of itself assists in the draining of the whey. The secret of success in the management of the curd after the drawing of the whey consists largely in the ability of the maker to control the moisture content. The expulsion of the whey and the development of acidity must proceed hand in hand as each acts and re-acts upon the other. The turning and breaking are usually practised two or three times, but this is dependent upon the general condition of the curd as regards dryness and acidity. When ready for grinding, a stage which is generally reached one hour after the drawing of the whey, the test on the hot iron should be three-quarters of an inch, the condition of the curd at this point being soft and velvety to the touch, while it should break short rather than have any tendency to toughness. It is ground to a fine state, and on pressing a handful of curd it should be moist, mellow, and free, with a smaller amount of excess moisture than a Derby, yet more than is required in a Cheddar cheese. Salt is added at the rate of 1 oz. to 3 lb. of curd, and moulding is done at once: the weight of curd obtained will vary according to the season, the average yield being 1¼ to 1⅓ lb. per gallon of milk. When the moulds are quite filled they are put under the press, the acidity from press tested with the acidimeter showing ·5 to ·6 per cent.

The cheeses are left for two hours, just the dead weight of

the press being applied, when they are turned, and pressed again for a further period of two hours; the pressure is then taken off, the cheeses turned again, and left to stand on the shelf during the night. During the following day the cheeses are allowed to remain in the moulds, and a slight greasiness appears on the coat. On the morning of the second day the coats are scraped with a knife until smooth, then bandaged, using calico and paste: it is an advantage to allow the bandage to come well over the edges in order to preserve them from cracking. After remaining about a day for the bandage to dry a little, the cheeses are removed to the ripening-room, where they must be turned daily. In ten days' time they should be ready for sale, and on stripping off the calico a smooth clean surface is found, while the ends of the cheese not covered with the bandage will be nicely coated with mould. In consideration of the fact that the cheeses are small and consequently much surface is exposed to the air, the percentage of loss in weight is small, one gallon of milk producing slightly more than 1 lb. of ripe cheese. If for retail trade, the cheeses should be offered for sale in a manner pleasing to the eye, and wrapping in tin-foil is to be recommended.

PROGRESS OF THE SUGAR BEET INDUSTRY IN NORFOLK.

WALTER E. SAWYER.

This year all our interests are centred in the endeavour, which is being made by Mr. E. S. Ali Cohen, with the assistance of the Norfolk Chamber of Agriculture, and of many farmers and landowners, to make this year's trial a success that will justify the erection of a sugar beet factory in Norfolk. The trials made last year in Norfolk on a small scale conclusively proved that we could grow sugar beet of good sugar content and in sufficient quantity to make it profitable, and suggested that it was only necessary to do the same thing on a larger scale to turn the experiments to commercial account. Several hundred acres are being grown this year in plots of varying size up to 25 acres, and by overcoming difficulties gradually, we hope to be in a position another year to contract for a much increased area. It is

necessary, however, to proceed slowly, so as not to put too much strain on the labour question without due preparation.

The terms offered by Mr. Cohen for this year are understood to be approximately as follow :—

(1) A guarantee of £3 per acre net profit, if the land be approved after inspection by experts.

(2) Cultivation expenses not to exceed a total of £9 per acre. Seed supplied and drilled free.

(3) Expert supervision, instruction, and assistance provided during growing and harvesting.

(4) Produce accepted this year at 18*s*. 6*d*. per ton net,* free on rail, wharf, or quay, pending the erection of a factory in this county.

(5) Contracts offered for years 1912, 1913, 1914 at £1 1*s*. 6*d*. at factory, or accepted on rail same price minus carriage to factory.

(6) Dried sugar pulp guaranteed to contain 30 per cent. sugar at a price not to exceed £6 10*s*. per ton at factory, and growers this year to have it supplied them, imported, at the same price free on rail Harwich.

Directions for Cultivation.—The land has now all been inspected, and a few cultural directions have been issued, both for this year and for future years, as the contracts have come in very well for 1912–13–14.

The general recommendations are:—The land to be manured in the case of heavy or light clay soil in October, November, and December with farmyard manure at a rate not exceeding 30 tons per acre. In the case of light and sandy soils the manure is to be applied in March, preferably a fortnight or so before sowing the seed. In both cases the manure is to be ploughed in to a depth of 12 or 13 inches.

The land, if clean, will then only require harrowing and getting to a fine tilth, and rolling down is necessary; if at all foul, it must, however, be thoroughly cleaned. Then it is to be drilled, after which the light harrows follow, and it is left rolled down.

As soon as the young plants appear in the rows the weeder

* The net weight will be fixed by taking a sample of half-a-cwt. out of a lot of six tons, which sample will be cleaned. The difference ascertained by such cleaning will be considered as tare, and calculated per ton. The average tare will be deducted over the whole lot offered for delivery.

FIG. 1.—DUTCH DRILL. (Back view.)

FIG. 2.—DUTCH DRILL. (Front view.)

or horse-hoe must be got to work, and at that time a top-dressing of nitrate of soda, 15 per cent. nitrogen, about 1 cwt. per acre, is to be given. The rows will be plainly visible in a favourable season in twenty-one days.*

About a fortnight later, the plants being strong enough, the cutting-out is to commence, and that is done by crossing the drilling with the imported horse hoe, and then the final singling is done by hand-picking. The plants then will be either 13 inches or 14 inches from row to row, and singled to about 13 inches apart. A second dressing of 1 cwt. nitrate of soda is then recommended.

The crop must afterwards be kept clean by constant horse-hoeing as long as possible, as well as by hand-hoeing. By about July the leaves should cover the land, and so render further work impossible.

Drilling.—We have had the use of three imported Dutch drills, two of which drilled the seed ("Kleinwanzlebener") 14 inches, and one 13 inches from row to row, at the rate of 16 lb. per acre, quite shallow, not more than ¾ in. to 1 in. deep, all on the flat. They are a novelty to us as regards construction, but are the general-purpose drill, as used generally in Holland, and are capable when all the seed coulters are in work of drilling 11 rows at a time.

They have a front steerage operated by a lever at the back, so that it is possible for one man to drive the horse and attend to the drilling at the same time, and an expert can cover about 12 acres per day. The attachment for the horse is such that it gives great liberty, and it is not necessary for the horse to walk particularly straight; in fact, so long as he keeps in the right direction, it allows the drilling to be done to a nicety and compare favourably with that done with a back-steerage drill. The drill is put in and out of work by a lever in a very similar manner to an American drill.

Hoeing.—As we have had excellent weather, the beets have germinated very quickly, and at the end of May horse-hoeing was in full swing, the plants showing well with four leaves.

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* This year seed was drilled on April 19th, 20th, 21st, and horse machines started on May 24th, 25th; so that the interval was more than 21 days.

There are three imported horse-weeding or hoeing machines at work here now. They are in many details as unique as the drills. They work with four large Λ hoes, 9¾ in. for the middle four rows and two smaller Λ hoes 7¼ in., which take part of the outside row, and return in the same row on going down a field as coming up, thus taking five rows at a time. The horse walks *on* or *straddles* over the middle row, and it is said the damage done is infinitesimal. Certainly when quite small the plants do not appear to get damaged; what will happen later remains to be seen.

The hoe itself is governed by a rack and pinion steerage, operated from the back by a steerage post and two handles, and in use the operator only has to keep the middle row in exact line with his steerage post, and all is well. When the plants are quite small, to prevent the hoes crowding the mould over them and smothering them completely there is an ingenious attachment of revolving discs which fit on the shanks of the hoes and run on each side of the tiny plants, and act as guards, thus allowing hoeing to commence quite early. When the land is reasonably fine they are of great use. Unfortunately, this year the land, especially on heavier soils, is inclined to be rough. The machine is quite lightly made, and one horse harnessed by traces attached to the collar can work the five rows comfortably.

Manuring.—Most of the lands growing sugar beet were manured in the autumn with farmyard manure, though some were done in the spring.

As regards the artificial manures on the various lands the four following are being used (per acre in each case):—

(1) 3 cwt. compound manure containing 7 per cent. ammonia and 9 per cent. phosphate.

(2) 3 cwt. superphosphate, 1 cwt. sulphate of ammonia, and 1 cwt. sulphate of potash.

(3) 4 cwt. compound manure, containing 35 per cent. phosphate, 2½ per cent. ammonia, and 2½ per cent. potash.

(4) 2 cwt. sulphate of ammonia.

There is still some prejudice against the crop, as some say it is exhausting. This is not, I think, borne out by facts, but after this year we shall have our own results to go by,

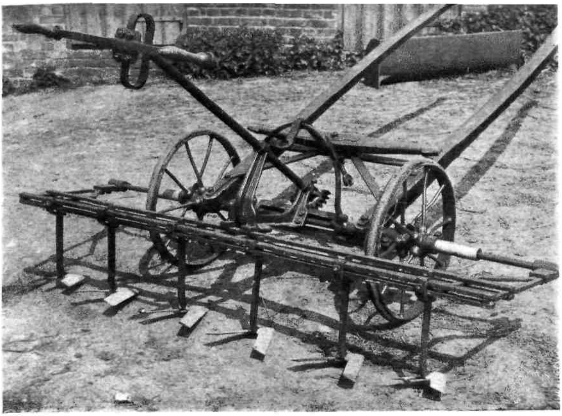

Fig. 3.—Dutch Horse-Hoe or Weeder.

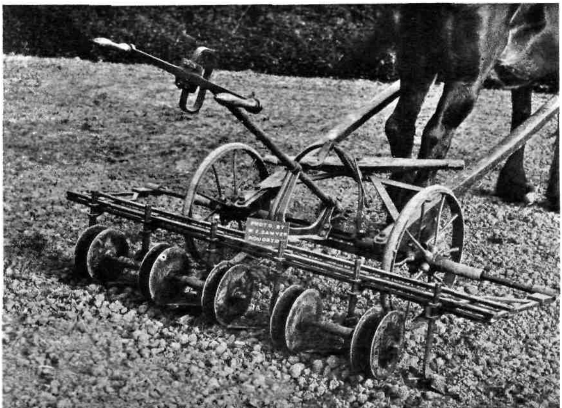

Fig. 4.—Dutch Horse-Hoe with Discs.

as last year's sugar-beet ground will provide evidence on this point.

For the Royal Show held at Norwich this year we are promised some results and practical demonstrations of pulp feeding *versus* ordinary food, such as is used generally in the county in the same way. It is also hoped that addresses will be given with regard to the industry.

PLANTING, CLEANING, AND CUTTING WILLOWS.

W. PAULGRAVE ELLMORE and THOMAS OKEY.

THE previous article * on Osier and Willow Cultivation dealt with the preparation of the ground, the supply of labour, and some other local conditions which must be taken into account in farming a plantation. The next point to be considered is the method of planting.

The late Mr. William Scaling recommended an appliance consisting of an oblong frame with two centre bars, one end and side having iron guides attached to denote the correct distance from the last sets; two men were needed to work it and were able to insert four rows simultaneously. Notches were cut in the outer frame and the inner bars to indicate the places for the planting of the sets, which were carried in four boxes, two being fixed on each end of the frame. The result, however, was not satisfactory, as it was difficult to keep the lines perfectly straight, and, in addition, the frame became very heavy to move about on account of the accumulation of soil upon it.

The more general method is to use an Italian hemp cord, of three ply, with strips of linen passed between the strands of the cord at regular intervals as indicators for the sets. This works better, but often throws the sets out of their true distances, because in the length adopted (40 yards) the cord varies according to the dryness or humidity of the atmosphere. This method, however, will probably be found as useful as any other in the case of a small area, where it would

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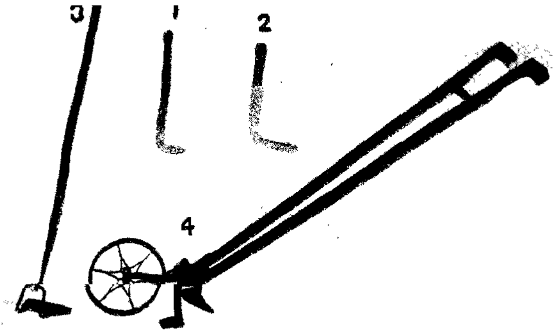
* *Journal*, April 1911, p. 12.

scarcely be worth while to go to the expense of a suitable planting chain.

A still less expensive way is to use any kind of cord and cut a stick equal in length to the distance between the plants, using that to show the distances at which to insert the sets. To overcome the difficulty created by a shortening or lengthening of the cord, Mr. Ellmore, for many years, has used a planting chain, somewhat similar to those employed by



HOES AND KNIVES USED IN CONNECTION WITH WILLOW GROWING.
1 and 2, Cutting-hooks or Knives; 3 and 4, Hoes.

land surveyors, but made in a less costly manner, with one-inch rings inserted at equal distances as guides for the planter. Every third link should be fitted with a swivel, to prevent the twisting or linking up of the chain. This produces perfect work provided a guide square is used for the purpose of first setting out the ground, which should be squared from one side and end so as to throw as many as possible of the pikings to the other side and end.

It is customary for willow growers, alike in Great Britain,

France, Belgium, Germany, and Holland, to plant closer in the rows than between the rows, though the reason for this is not known. Mr. Ellmore's plan is to plant always in squares, *i.e.*, at equal distances between heads and rows, but varying according to the natural growth of each particular variety. "Square planting" is a decided advantage as it enables the cleaning to be done by the horse hoe for the first few years. The hoe can be used in two directions, which, of course, cannot be done if the distances are less between the heads than the rows. The proper ripening and hardening of the wood also is dependent on the action of the sun, and this system gives sunlight free access to the head in the growing period. It also stimulates the growth, since the roots have an equal quantity of soil all round from which to draw their support.

Age of Plants.—A diversity of opinion prevails as to whether the sets should be cut from one- or two-year-old rods. Some growers prefer one-year-old, believing that they throw off more shoots the first season than two-year-old sets. This belief may have some foundation, especially if the two-year-old sets are cut from the butts of a badlv-grown two-year-old crop, which is often the case with inexperienced or careless growers. The practice recommended, however, is to leave the best-grown and healthiest one-year-old rods for two years' growth, having first cut out all the smaller growths, so as to afford the greatest amount of support possible for those left on the head, and, in our experience, this method gives the best financial result. From such rods six or seven sets can be cut, and it is obvious that healthy plants will give a better crop than cuttings from dwarfed or badly-grown rods. When, however, only two or three sets are taken from the rod, and this is a very common practice, the argument in favour of the younger or one-year-old rod holds good.

The third and higher sets cut from a two-year-old plant throw out more shoots than the sets cut close to the butt end, where the wood is harder and the eyes are consequently less active, but, on the other hand, there is always a great risk in using one-year-old sets, owing to their thinner size and less resistant calibre. Under the influence of dry winds and an absence of showers in the months of April and May

they will very often die or sicken, whilst two-year-old sets, being much stouter and their bark far thicker, will withstand the dry time more successfully.

Twelve inches is the best length to cut the sets. They must be cut on the slant for inserting in the ground; but the end which is to remain out of the ground should be cut nearly straight and just above an eye. With this extra care very few sets will show any dead wood, and a nicely-shaped head will be the result. The cutting of the sets must be performed with a sharp knife, so as not to bruise the bark or wood. They must be buried so that about one inch is left exposed above the surface, and the eyes must always point upwards. The land, being freshly broken up, will subside a little during the summer, leaving the head something like two inches out of the ground. If the sets are cut longer the extra length is wasted, because the roots seldom strike more than ten inches below the surface, whilst if the sets are left higher out of the ground the crop—after the close of the growing season—will be needlessly exposed to the winter winds, which have great force, and sway the heads to such an extent that they are often loosened, and consequently die through the admission of frost and water. Particularly is this the case with the first, or maiden, crop, on account of the small root growth. The closer the head or stool is to the ground the greater resistance it can offer to the action of storms. Many French growers have been used to plant sets at an angle of 45 degrees on the supposition that they thus root more freely. This we believe to be an error, and indeed it is now being discarded in favour of vertical planting.

Growers should always plant more than one sort, because seasons vary greatly, and whilst one may do well generally, it often happens that another will do far better. It is indispensable that every species or variety be planted true to its kind. We cannot be too emphatic on this point, because when sold green for buffing different kinds produce marked contrasts in colour, even when the treatment is identical, and when this is the case the market for high-class manufactured goods is either lost or a much lower price realised. Nothing from the standpoint of the skilled worker is worse than to see several shades of material in his product. The

importance of this consideration when the willows are intended for white is not less, owing to the great variation in the time during which the sap rises, and owing to which the early sorts peel well and the backward sorts require to be scraped to remove the bark from the butt ends. This again greatly reduces the market value. By planting several sorts the requirements of the all-round trade will be met, and the longest time possible be gained for harvesting the crop. Between the earliest and the latest sorts there is sometimes a period of three weeks.

Whether any practical result is to be obtained from experiments with sexual difference in willows is extremely doubtful, although it opens up a field for botanical and scientific research. We have not, in our experience, discovered any marked difference between the crop from the stool of the staminate form and that of the pistillate form. Consequently it may be regarded as a matter of indifference from the standpoint of the bulk or quality of material produced whether one or the other, or both, are planted indiscriminately.

Cleaning.—The ground being now planted it is most essential that all weeds should be kept down by hoeing. In the case of maiden crops hoeing right up to August 1st is resorted to, in order to maintain the surface of the soil in a loose condition. If this is allowed to bake or crack many heads will be found dead the following spring, and the grower will be fortunate if failure to keep the top soil open does not bring a blight on the crop. It should be remembered that a heavy strain is imposed on the plants, which are endeavouring to develop simultaneously a shoot growth above ground, and a root growth below. For lack of sufficient hoeing during the first year we have seen many acres destroyed by green fly and honey dew, especially if the spring had proved to be a dry one; and this has not only resulted in a year's loss of growth, but also necessitated planting again the following season. In the case of older heads the hoeing ought not to be discontinued whilst the men can move freely in the crop, which they generally can do up to the middle of June. By that time the willows begin to make such rapid growth that they smother all the undergrowth, and only in the outsi(

Several methods are adopted for keeping the land clean. One found most suitable in Leicestershire is the employment of a three-tined horse hoe with an arrow-shaped blade on the front and two inward blades in the rear. This can only be used if great care is exercised to prevent barking the head by striking it with the hoe, thereby occasioning considerable exhaustion of the plant, and consequently a defective crop. Moreover, this hoe can only be brought into play for the first year or two, whilst the heads are sufficiently small, and the spaces allow a pony or small horse to travel between the rows. A swan-necked hoe will usually be found the best tool for this purpose.

Cutting.—The termination of the growth and the ripening of the wood will be determined better by the fall of the leaf than by the calendar. This stage varies in England from the end of October to the middle of November. When the leaf has nearly all fallen the rods are ready for cutting, but it is not advisable to commence cutting at this early period except for the purpose of buffing, which operation should be begun on the earliest possible date, in order to take full advantage of the short mild season before Christmas.

It will be found profitable to leave a portion of the one-year-old crop standing for two-year-olds. This undoubtedly gives the heads a rest, and the succeeding crop of one-year-olds will be found taller and heavier than that from the heads which have been cut each year. About every fifth or sixth year is recommended for this rule to be carried out. Another good practice is to cut out with a sharp knife or fine shears all the smaller or rough growths. This will amply repay the grower for the labour expended, for, if left on the heads, these worthless growths will draw a certain amount of vitality from them, and ultimately get smothered by the more vigorous rods, and need to be sorted out when cut. There is always a very active and profitable demand for well-grown two-year-old rods of good quality, either as buff or white, for manufacturing strong hampers, such as are largely used in the hosiery-making districts, as well as in Yorkshire and Lancashire. These two-year-olds are required for what are called staking, or lid and bottom sticks, around which the one-year-old rods are worked.

Cutting is usually done by men with the kind of knives illustrated, both of which are excellent tools. In no circumstances must this part of the work be performed in a slipshod or careless manner. The knife must be inserted on the outer side of the rods, and cut inwards and upwards, and quite close to the head, with a sharp and clear cut, free from split wood or torn bark. When the cutters are careless many small spurs will remain on the head, and since these spurs form the butt end of the rod, much material is sacrificed, and since the crop is sold by weight a needless financial loss is the result. Moreover, these spurs invariably die off during the next growing season, dead wood accumulates, and still further and longer spurs are left when cutting time again comes round, until in the course of a few years the head, which should at no period be larger than a fair-sized orange, is frequently found as big as a cabbage. Round this accumulate moss and various fungoid growths, and the bearing capacity of the head is reduced in some instances quite 50 per cent. When some of the spurs live, as frequently happens, they throw off many small and half-developed rods, tending to the earlier exhaustion of the head. Cutting the maiden crop, over which too much care cannot be shown, and on which the future compact head-formation depends, should be done by day workers. Afterwards cutting is invariably done on piece-work terms, from *2s. 3d.* to *2s. 6d.* being the average price for twenty bundles, each a yard, or in some counties, 42 inches in girth, the band being tight and fixed 10 inches from the butt. Another common way of letting by the piece is to pay *6s. 6d.* to *7s. 6d.* per ton for a one-year-old crop, including the carrying of the bundles to various points for collection by the carters. The prices vary according to the sizes of the rods, the larger varieties being the cheaper. In this manner all dispute as to whether the bundles are tied up tightly or loosely is obviated.

A willow ground cultivated as directed will last about twenty years in a full-bearing condition, and still be a profitable source of income for ten years longer. All sickly heads should be removed each winter, and the vacant places filled by a well-grown one-year-old of entire length, or a tall-grown two-year-old cut off at the start of the two-years' growth. A

still better method is to set apart a small plot of ground and grow yearly a sufficient number of each variety for transplanting, in which case the cuttings may be set 12 ins. square. The tap root and also the longest and weakest of the fibres should be shortened a little with a sharp knife, care being taken to leave no ragged wounds to bleed when active growth should be in progress. Only one shoot, the longest and strongest, should be left on the head. A healthy transplanted maiden head will never fail to establish itself. In this way the life may be prolonged, as in the case of a 16-acre field at Wanlip, near Leicester, which, although planted over twenty-five years ago, cut from six to eight tons of one-year-old green to the acre, which realised £5 per ton *in January, 1911.*

THE ALDER AND OSIER WEEVIL (*Cryptorhynchus lapathi*, L.).

R. STEWART MACDOUGALL, M.A., D.Sc.

C. lapathi chiefly attacks and uses as brood places alder and willow, while it also occasionally and exceptionally infests birch and poplar. This weevil is found in England, where locally it may be common; it is not common in Scotland.

Alnus glutinosa, Gartn., and *Alnus incana*, Willd., are both infested, and attacks on Alpine Alder (*Alnus viridis*, Dec.) have been recorded in the Continental literature. Among Willows, *Salix capraea, S. viminalis, S. purpurea*, and *S. triandra* are host plants.

The Alder and Willow Weevil is destructive, both as adult and as grub. Branches of alder, two years old and some years older, are freely attacked, but poles of thirty years and more do not escape. In the willow, young shoot and branch and stem are attacked; where in cultivation the willow shoots are cut annually, the main stem is used as a place for the brood.

The damage is both technical and physiological; wood tunnelled by the larva is spoiled, while branches that have been attacked, but persist, are deformed.

There is loss and destruction in various ways:—

(1) The grub eats out a space below the bark, spoiling both

(2) The grub gnaws a gallery in the wood. Tunnelled branches break across, and are blown down by the wind.

(3) The adult punctures the bark, and gnaws the bark of branches right into the cambium. Such wounds afford suitable places of entry for the spores of some injurious fungi that are wound parasites.

(4) The tips of shoots are eaten so that the shoots bend over, fail to elongate, and die.

(5) The bark undermined and tunnelled by the larvæ dies, sinks in, and ultimately crumbles, exposing the sapwood.

Symptoms of Attack.—(1) The yellowing of the leaves, and the gradual withering of the shoot.

(2) The change in colour of the bark just above the feeding place of the young larva.

(3) The sawdust that is sent out from the larval gallery. This sawdust and the thread-like spales of wood, from the gnawing of the larva, may remain on the outside of the bark round and below the external bore-hole, sticking together in a clump; this material may also fall to the ground below.

(4) The canker-like places on the outside that result from larval attack.

(5) The round flight holes of the adult beetles.

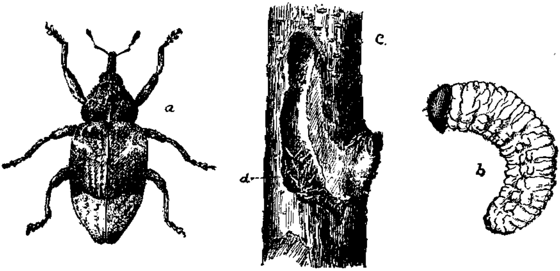
Description.—*Adult:* The beetle measures about $\frac{1}{3}$ inch in length; it is dull black or black-brown in colour; the prothorax, the sides of the thorax, the hind third of the wing-covers, and the thighs are more or less thickly covered with chalk-white or yellow-white, or sometimes reddish-white scales; the antennæ are reddish, and clubbed at the apex; the rostrum or proboscis is well marked, but when the beetle is at rest the proboscis cannot be seen well from the upper surface owing to its being bent under the thorax; the wing-covers (examined with a lens) show a series of longitudinal lines and punctures, and erect tufts of black scales. The base of the wing-covers is square, but the apex is narrowed.

Larva: The larva is a legless grub with a whitish body and brown head and mouth parts.

Pupa: The pupa is yellowish-white, and lies in the larval gallery, with bent proboscis.

Life History.—The adult beetles are found from May onwards during the summer. The female lays her eggs

on or in the bark. The larva, on hatching, feeds first just below the outside bark (in thick material the larva may go at once towards the wood); the bark lying over this place of eating changes colour. Later this grub bores into the wood, and after the gallery has been bored for a short distance it takes an upward bend and runs longitudinally in the wood for 4 or 5 inches or more. In thin material the gallery may go right to the pith, but not so far in thicker stems. The larval galleries are round in transverse section, and are more or less filled with saw-dust and wood



ALDER AND OSIER WEEVIL (*Cryptorhynchus lapathi*, L.)
a. Weevil, × 4; *b.* Larva, × 4; *c.* Tunnelled wood, showing "frass" at *d*, × 2.

chips which may be seen on the outside projecting from a hole gnawed by the grub in the thin superficial bark at or beside the original entrance hole. The full-grown larva becomes a pupa at the end of the larval boring, and the beetle, on being ready, bites a round hole through the bark for its exit.

There is considerable difference of opinion as to the length of the generation, and whether it be a yearly or a two-yearly one. A one-year generation is the view most favoured. I have at present experimental material of alder under observation which perhaps will help to settle the question, and am of opinion that *C. lapathi,* just as in Nusslin's experiments and my own with the allied *Pissodes* species, has a long egg-laying period, and that there can be an over-lapping of generations according to the time of laying of the egg—May-

June-July-August, complicated by the onset of winter. Thus the winter can be passed as adult or as larva. It is not certain either that young beetles issuing for the first time in autumn are sufficiently ripe for egg-laying before hibernation. The favourite place for hibernation with the imago ready in autumn is the larval tunnel.

Treatment.—While willow is a host plant, as is shown by the fact that complaints have been sent to the Board of attacks on willow, alder is very willingly or preferably used for brood purposes, and hence planting alders here and there in willow plantations might serve as a useful preventive measure against attack on willows; the alders would then serve as traps.

There should be timely cutting away and burning of infested branches or stems.

THE COMPOSITION AND PROPERTIES OF CONCENTRATED FEEDING-STUFFS.*

In making purchases of cakes and other feeding-stuffs, a farmer often experiences a difficulty in arriving at a conclusion as to what material to buy, or which particular brand of cake to select.

It is clear that cost per ton is by no means the only factor that should influence his choice, but he is frequently uncertain as to precisely what other considerations should be taken into account, and what degree of importance should be attached to them.

It is the object of this article to furnish a guide to the farmer in the purchase of foodstuffs. Information as to the compounding of rations for farm stock is given in Leaflet No. 79.

The first essential for the intelligent purchase of foodstuffs is that the farmer shall have a clear understanding of the nature and composition of foods, what functions in the animal the different ingredients perform, and the requirements and limitations of different classes of live-stock. *With* this knowledge it is possible to ascertain precisely in what respects

* *This article is now issued as a revised edition of Leaflet No. 74. Though some portions of the earlier edition of the Leaflet have been retained, the bulk of this article has been written by Dr. Charles Crowther, of The University, Leeds.*

and to what extent home-grown foods are deficient, and to purchase only such foodstuffs as can supply the deficiency to the best advantage. *Without* this knowledge one may be misled into purchasing materials which, though excellent enough in all general respects, are unsuitable and wasteful for special purposes. It should be understood, for example, that if decorticated cotton cake or soy bean cake is suitable for a given purpose, certain other foods (*e.g.*, maize, locust beans) cannot alone supply the requirements efficiently; that a milking cow requires a ration of very different composition from that which is most suitable for a fattening bullock (*vide* Leaflet No. 79); and that the use of certain foodstuffs (*e.g.*, undecorticated cotton cake) is attended with an element of risk, especially in the case of young animals.

Armed with knowledge of this character, the farmer, in estimating the relative merits of the different feeding-stuffs to which his attention is directed, should first of all obtain representative samples and submit them to careful inspection, using a magnifying glass for the purpose if possible. He may thus be able to detect any gross adulteration (weed seeds, dirt, &c.), and satisfy himself as to the palatability, freshness, hardness (if a cake), and other outward characteristics of each material.

Assuming that the foods are practically of equal value in these respects, the next proceeding should be to consider their suitability for the class of stock for which they are intended. (Information on this subject will be found in Leaflet No. 79.)

By this preliminary process of selection the unsuitable foods will be eliminated, and it will remain to ascertain which of the suitable foods it is most satisfactory and economical to purchase. This will be determined as regards a given feeding-stuff :—

a. By its *composition, digestibility,* and "*productive* value."

b. By its content of manurial ingredients.

The general significance of these factors is obvious, but it is necessary to indicate how they are taken into account in comparing the values of foods.

General Composition of Foods.

The component parts of all foods, whether home-grown or purchased, may be classed as follows :—

- Feeding Stuff
  - Water
  - Dry Matter
    - Nitrogenous substances.
      - Albuminoids (Proteins)
      - Amides
    - Non-nitrogenous substances.
      - Fats and Oils
      - Soluble Carbohydrates
      - Crude Fibre
      - Mineral matter (Ash).

Commencing from the top, it will be seen that feeding-stuffs are primarily made up of water and dry matter, and that the latter consists of nitrogenous and non-nitrogenous constituents, which, again, may be sub-divided—the nitrogenous into albuminoids and amides, the non-nitrogenous into fats, carbohydrates, fibre, and mineral matter.

Albuminoids.—The albuminoids (or proteins) form a large and complex class of compounds. They are the true flesh, lean meat or muscle formers, and are sometimes termed the "essential" or "indispensable" food ingredients, because without them life could not be maintained. They contain nitrogen to the extent of about 16 per cent., which, together with part of the carbon, hydrogen, and oxygen, is utilised for the construction and repair of animal tissue; while the rest of their carbon and hydrogen, by combustion in the body, is utilised to maintain the heat of the animal and to supply energy or mechanical force. Beyond this, the albuminoids, if used in excessive quantity, may contribute to the production of fat, or, at least, may protect the fat stored up in the tissues from consumption. Only a relatively small proportion of the excess can be used in this way, however, and the rest is merely burnt up, and has no more value than an equal amount of carbohydrates, which are much cheaper. Many farmers supply their animals with unnecessarily large quantities of albuminoids, and thereby not only make their feeding unduly expensive, but in some cases may seriously affect the general welfare of their stock.

There is not yet sufficient reliable evidence to permit a definite statement as to the relative feeding values of the

albuminoids contained in different foodstuffs. There is some reason to believe, however, that marked differences may occur when individual foodstuffs are fed separately, but that these differences will tend to disappear when the foodstuffs, as commonly happens, are blended together in a mixed ration.

Of the foodstuffs commonly used in this country the richest in albuminoids are soy bean meals and cakes and decorticated cotton-seed meals and cakes, these containing usually upwards of 40 per cent. of albuminoids. Next in order of richness come soy beans (35–37 per cent.) and linseed cake and meal (28–32 per cent.), whilst beans, peas, dried grains, and malt dust all contain 20 per cent. or more.

Amides.—The amides, although containing nitrogen, are greatly inferior in feeding value to albuminoids. According to the evidence now available, they seem to have little or no direct value for the production of lean flesh or fat in the case of horses and pigs. In the case of ruminant animals (cattle, sheep, goats), however, certain amides or mixtures of amides can, to some extent, perform this function of albuminoids. In no case, however, has it been found possible to replace the albuminoids of the food completely by amides.

In all animals amides act as heat-producers, and therefore in this respect serve the same purpose in the body as the carbohydrates. In heat-producing capacity, however, the amides, weight for weight, possess only about half the value of carbohydrates.

Amides occur chiefly in immature or watery foods, such as young grass and roots; they are present in trifling quantities only in cereal grains, oil cakes, and other concentrated feeding-stuffs, with the exception of malt culms and molasses, so that, in the present connection, they may be left out of consideration.

Soluble Carbohydrates.—The most important soluble carbohydrates are starch, sugar, and mucilage. Carbohydrates abound in all foods and comprise the bulk of the feeding material in cereal grains, locust beans, molasses, hay, straw, and roots. In these foods they must be looked upon as the chief ingredients of value. In oil cakes, pulse grains, dried grains, and malt dust, on the other hand, the feeding value is derived to a large extent from albuminoids and fats.

The chief function of the carbohydrates is to supply heat and mechanical energy, and when fed in large quantity they are also capable of producing animal fat. In this latter respect starch appears to be superior to sugar, especially in the case of ruminant animals.

Fat and Oil.—The fats and oils are essentially heat-producers, and, weight for weight, are nearly 2½ times as valuable for this purpose as the carbohydrates. When sufficient heat-forming food has been consumed to maintain the temperature of the body, fats and oils may be converted into animal fat, and so increase the body-weight. Whether for the production of heat or fat, the fats and fatty oils are far superior to either albuminoids or carbohydrates, but their use is restricted to moderate quantities by practical considerations. Of the foods in common use linseed, soy beans, linseed cake, and decorticated cotton cake are the richest in fat, after which come dried grains, soy bean cake, undecorticated cotton cake, oats, and maize.

Crude Fibre.—"Crude Fibre" is that portion of the food-stuff which remains undissolved after boiling in weak acid and alkali. It represents those ingredients which are of a more or less woody character, and it is essentially an admixture of cellulose with highly indigestible substances (lignin, cutin). Its value for feeding purposes varies widely according to its mechanical character and the class of animal to which it is fed. All farm animals have considerable powers of digesting the soft fibre of green food, but only cattle and sheep can derive appreciable nourishment from the hard fibre of foods like straw. Horses occupy an intermediate position in this respect, whilst pigs can only deal effectively with the softest types of fibre.

A high proportion of crude fibre, unless it is normal to the food in question (*e.g.*, undecorticated cotton cake), should always be regarded with suspicion, since it usually indicates the presence of husks or other highly indigestible material.

In general, foods containing more than about 10 per cent. of crude fibre will require special care in their use, especially if the fibre is largely in the form of hairs or "woolly" material.

Mineral Matter.—Mineral matter, although performing an

indispensable function in animal nutrition, may be neglected in arranging diets for mature animals, as it is usually present in sufficient quantity in all foods. This constituent of food is of more importance in arranging diets for young, growing animals. It is then especially important that the ration shall supply suitable quantities of lime and phosphoric acid, since these ingredients enter so largely into the composition of the bones. The supply should be ample, but in the case of phosphoric acid not very excessive.

The mineral matter of foods should not include more than a very small proportion of sand, as this is indicative of dirt. It is impossible in practice to ensure that foods shall be absolutely free from contamination of this character, but there can rarely be any valid excuse for the presence of more than, say, one or two per cent. of sand in a food.

Digestibility of Foods.

It is usually not difficult to get an analysis of a food stating the proportions of albuminoids, oils, and carbohydrates present. Such an analysis, however, gives no information as to the digestibility of each ingredient, and yet it is only the digestible portions that can be regarded strictly as food. Except in the case of albuminoids, this information cannot be obtained in the laboratory, but recourse must be had to actual trials with animals. For the purposes of the valuation of foods, however, it will be sufficiently precise to take the average digestibility as tabulated on p. 225. A table giving the percentages of digestible constituents in average samples of the commoner feeding-stuffs will be found in Leaflet No. 79, p. 2.

Productive Value of the Digestible Matter of Foods.

One further consideration requires to be taken into account before a reliable estimate of the value of the food to the animal can be secured. The materials digested by the animal from a foodstuff cannot be applied solely and entirely to productive purposes such as the production of milk, meat, or work. Even the most easily digested foodstuff requires to be masticated and forced along the alimentary tract, and in other ways causes extra labour to the animal. The supply of the energy required for this labour is a first charge upon the nutrients

digested from the food, and only the balance is available for the productive purposes of the feeding. The tougher and more indigestible the food is, the greater will be the amount of digestible material diverted to unproductive purposes, and the lower will be the direct value of the food to the animal. In other words, if foods of very different character (*e.g.*, maize and undecorticated cotton cake) are compared, it is necessary to know not only the *amount* and *character* of the digestible matter in the food, but also its "*availability*" to the animal. The chief determining factor is the proportion and character of the crude fibre in the food, and in the case of all foods that are not markedly rich in crude fibre, no serious error will be committed if the digestible nutrients are regarded as fully "available." In the case of fibrous foods, however, the value of the digestible matter will be considerably overrated if the presence of an abundance of crude fibre is not taken into account (see later).

Manurial Ingredients in Foods.

All foods contain appreciable quantities of valuable manurial ingredients, notably nitrogen, phosphates, and potash. These ingredients are voided to a considerable extent in the solid and liquid excrements of the animals which consume the food. In the case of full-grown fattening animals or working horses practically all the fertilising ingredients are recovered in this way, but in the case of young animals and cows in milk the proportion recovered will be lower. The proportions of nitrogen, phosphates, and potash present vary greatly in different foods, and the value of the manurial residues arising from the consumption of equal weights of the foods varies accordingly. This fact must be taken into account in comparing the cost of different foods, since the real cost of a foodstuff to the farmer is obviously the price less the manurial value.

The latter value can only be assessed roughly and is subject in practice to great variations. For comparative purposes, however, the values given in the Table on p. 225 may be used.

Comparative Values of Foods.

Attempts have frequently been made to devise a satisfactory system of direct valuation of feeding-stuffs on lines com-

parable with those followed in the valuation of manures (*see* Leaflet No. 72). "Unit" prices for albuminoids, fats, and carbohydrates have been calculated from the market prices of different foodstuffs, and these have then been used for valuation purposes. The system proves far more unreliable in its application to feeding-stuffs, however, than in the case of manures, owing to the fact that, unlike the latter, the market prices of different foodstuffs are regulated with but little regard to their composition. For this and other reasons the direct method has been generally abandoned in favour of the comparative method in which the value of a foodstuff is estimated by comparison with the price at which another of similar character and known composition can be obtained.

Two such methods are explained below, the first of which can claim little scientific basis, but is found to work fairly well in practice, and is commonly used, whilst the second method is more scientific but more complicated.

FIRST METHOD.—For the purposes of the comparison it is assumed that digestible albuminoids and fats are worth 2½ times as much as digestible carbohydrates. The percentages of digestible albuminoids and oil are therefore added together and their sum multiplied by 2½. To the figure thus obtained is added the percentage of digestible carbohydrates, and the total is referred to as the number of "food-units" in the material. The price of a food-unit in one particular foodstuff is then ascertained by dividing its price per ton by the number of food-units contained in it. This "unit-value" can then be used as a standard by which to gauge the value of other similar foodstuffs of known composition. The following examples will illustrate the method.

Example I.—Suppose that two linseed cakes are offered with the guaranteed compositions and at the prices stated—

	A.	*B.*
Albuminoids	32 per cent.	28 per cent.
Oil	11 ,,	9 ,,
Sol. Carbohydrates	34 ,,	35 ,,
Price per ton	£9	£8 10s.

The numbers of food-units in each cake will be as follows:—

Cake A (32 + 11) × 2½ + 34 = 141½, or say, 141
Cake B (28 + 9) × 2½ + 35 = 127½, ,, 127

In the case of Cake A, 141 units are obtainable at a cost of £9, and the cost per unit is therefore $\frac{£9}{141}$ = 1s. 3¼d. Hence if Cake B is to be relatively equal to it in cost, the price per

Digestibility (per cent.) and Manure Values (per ton) of the Commoner Feeding-stuffs.

Feeding-Stuff.	Digestibility Per Cent.*				Estimated Value of Manurial Residues arising from Consumption of One Ton of Feeding-Stuff. (Hall & Voelcker.)†
	Albuminoids.	Fats.	Soluble Carbohydrates.	Crude Fibre.	£ s. d.
Decorticated Cotton Cake	86	94	67	28	2 16 5
Undecorticated ,,	77	93	52	18	1 13 9
Linseed Cake	86	92	78	32	1 18 7
Linseed	91	86	55	60	1 10 6
Soy Bean Cake	90	88	95	50	2 13 6‡
Soy Beans	89	90	69	36	2 1 8‡
Cocoanut Cake	78	97	83	63	1 11 6
Beans	87	83	91	58	1 11 8
Peas	86	65	93	46	1 7 4
Locust Beans	68	53	95	58	0 12 2
Bran (Wheat)	79	71	71	26	1 8 11
Malt Culms	80	71	73	55	1 15 11
Brewers' Grains (Wet) ...	73	86	62	40	0 6 0
,, (Dried) ...	71	38	60	48	1 4 3
Rice Meal	57	85	80	15	0 14 3
Wheat...	84	64	92	50	0 14 10
Barley...	70	89	92	48	0 13 9
Oats	76	80	76	28	0 15 5
Maize	72	89	95	58	0 13 0
Meadow Hay	57	51	64	59	0 16 4
Clover ,, ...	54	53	64	46	1 1 9
Oat Straw	33	36	46	54	0 7 7
Barley ,, ...	25	39	53	54	0 6 9
Bean ,, ...	49	57	68	43	0 16 1‡
Pea ,, ...	60	46	64	52	0 13 4‡
Potatoes	51	—	90	—	0 4 6‡
Mangolds	70	—	95	37	0 3 1
Swedes	80	84	95	74	0 2 6
Turnips	73	—	92	51	0 2 4

* Digestion by ruminants, based upon summary by Kellner.

† In estimating these values the unit-value of nitrogen, phosphoric acid, and potash have been taken at 12s., 3s., and 4s. respectively, and it has been assumed that the combined excrements, when applied to the land, contain one-half of the nitrogen, three-quarters of the phosphoric acid, and the whole of the potash contained in the ton of food.

‡ Data for these foods are not included in Hall and Voelcker's table.

ton demanded must not exceed 127 × 1s. 3¼d., *i.e.*, £8 1s. 6d. The price actually charged is thus probably somewhat in excess of the value of the cake as compared with Cake A at £9 per ton.

In this example two foods composed of practically the same ingredients are compared, and the assumption has been made that they are therefore of equal digestibility. If the foods are of similar character, but composed of different ingredients (*e.g.*, a linseed cake and a soy bean cake), the procedure is precisely the same except that the percentages of *digestible* albuminoids, &c., must first be calculated in each case from the guaranteed percentages of total albuminoids, &c., and then the sum of the digestible food units calculated from them. The following example will illustrate this case.

Example II.—Suppose it is desired to compare the linseed Cake A (Example I.) with a decorticated cotton cake containing 40 per cent. of albuminoids, 9 per cent. of oil and 72 per cent. of carbohydrates at £8 15*s*. per ton.

Using the data given in the Table on p. 225, the percentages of digestible nutrients in these foods are obtained as follows:—

	Linseed Cake.		Decorticated Cotton Cake.	
	Total.	Digestible.	Total.	Digestible.
	Per cent.	Per cent.	Per cent.	Per cent.
Albuminoids	$32 \times \frac{86}{100}$	$=27\frac{1}{2}$	$40 \times \frac{86}{100}$	$=34\frac{1}{2}$
Oil	$11 \times \frac{92}{100}$	$=10$	$9 \times \frac{94}{100}$	$=8\frac{1}{2}$
Carbohydrates	$34 \times \frac{78}{100}$	$=26\frac{1}{2}$	$27 \times \frac{67}{100}$	$=18$

Then the total numbers of *digestible* food-units in each case are:—

Linseed Cake ... $(27\frac{1}{2} + 10) \times 2\frac{1}{2} + 26\frac{1}{2} = 120$
Decort. Cotton Cake $(34\frac{1}{2} + 8\frac{1}{2}) \times 2\frac{1}{2} + 18 = 125$

The cost per digestible food-unit of the linseed cake is $\frac{£9}{120} = 1s.\ 6d.$ At this rate the decorticated cotton cake should be worth 125 × 1*s*. 6*d*., or £9 7*s*. 6*d*. per ton.

In this method of comparing the prices of feeding-stuffs it is assumed that the differences in manure-values will be sufficiently allowed for in the high value that is assigned to the albuminoids, since it is the nitrogen contained therein that mainly determines the differences in manure-value between different foods.

The method works fairly well in practice so long as only materials of similar character are compared, but is very unreliable if applied to foods of widely differing character.

SECOND METHOD.—In this method the manure-value per ton of the foodstuff (*see* Table, p. 225) is first deducted from the price, and the balance then regarded as the nett cost. The subsequent procedure is then similar to that used in the first method, except that only the percentage of digestible oil is multiplied by 2½, the albuminoids in this case being ranked equal only to the carbohydrates. This is in accordance with the most recent determinations of the relative values of the nutrients *to the animal* for productive purposes. Other factors which tend to raise the *market* value of albuminoids beyond this level will be discussed later.

For the purposes of illustration the case of the linseed cake and decorticated cotton cake compared in Example II. above may be taken. In each case the nett cost per ton is equal to the price per ton, *less* the manure value per ton; thus:—

			Nett Cost per Ton.
Linseed Cake ...	£9	− £1 18*s.* 7*d.*	= £7 1*s.* 5*d.*
Decort. Cotton Cake	£8 15*s.*	− £2 16*s.* 5*d.*	= £5 18*s.* 7*d.*

The number of food "units" in each case will be—

Linseed Cake ... (10 × 2½) + 27½ + 26½ = 79.
Decort. Cotton Cake (8¼ × 2½) + 34½ + 18 = 74.

The cost per "unit" of the linseed cake will be $\frac{\pounds 7\ 1s.\ 5d.}{79}$ = 1*s.* 9½*d.* At this rate the nett cost of the cotton cake should not exceed 74 × 1*s.* 9½*d.*, or £6 12*s.* 7*d.* This will represent a market price of (£6 12*s.* 7*d.* + £2 16*s.* 5*d.*) or £9 9*s.* per ton.

This method of assessing the comparative values of foodstuffs can be used with slight modification for the comparison of foods of very different character. In this case the "food-unit" totals by themselves are not a true measure of the relative values of the foods to the animals, since they take no account of the fact that the matter digested from an easily digestible food is utilised in the animal much more efficiently and economically than the matter digested from a more indigestible food. This difference turns largely upon the amount and character of the crude fibre present in the different

foodstuffs, and may be allowed for by deducting from the total of food-units (including in this case the digestible fibre) one unit for every 3 per cent. (or 2 per cent. in the case of hays and straws) of crude fibre (total) present in the food.

Thus, suppose it is desired to compare the decorticated cotton cake of Example II. with an undecorticated cotton cake containing 22 per cent. of albuminoids, $5\frac{3}{4}$ per cent. of oil, 34 per cent. of carbohydrates and 20 per cent. of crude fibre. This composition would correspond (Table, p. 225) to the following percentages of digestible nutrients:—Albuminoids 17, oil $5\frac{1}{2}$, carbohydrates $17\frac{3}{4}$, and fibre $3\frac{3}{4}$.

Decorticated cotton cake of average quality will contain, say, 8 per cent. of crude fibre, and hence $2\frac{1}{4}$ per cent. of digestible fibre.

Then the total number of food-units in each case will be—

Decort. Cotton Cake ...	$(8\frac{1}{2} \times 2\frac{1}{2}) + 34\frac{1}{2} + 18 + 2\frac{1}{4} = 76.$
Undecort. Cotton Cake...	$(5\frac{1}{2} \times 2\frac{1}{2}) + 17 + 17\frac{3}{4} + 3\frac{3}{4} = 52\frac{1}{4}.$

These totals must now be subjected to the deduction, referred to above, based upon the percentages of crude fibre in each food. The corrected totals then become:—

Decort. Cotton Cake ...	$76 - \frac{8}{3} = 73.$
Undecort. Cotton Cake...	$52\frac{1}{4} - \frac{20}{3} = 45\frac{1}{2}.$

The nett cost per unit of the decorticated cotton cake is then $\frac{£5\ 18s.\ 7d.}{73}$ or 1*s*. $7\frac{1}{2}d$. At this rate the nett cost per ton of the undecorticated cotton cake should not exceed $45\frac{1}{2} \times$ 1*s*. $7\frac{1}{2}d$. or £3 13*s*. 11*d*. Adding to this the estimated manure value per ton of £1 13*s*. 9*d*. (Table, p. 225) we arrive at an estimate of £5 7*s*. 8*d*. per ton for the market value of this cake as compared with the decorticated cake at £8 15*s*. per ton.

The results arrived at by either of these methods require to be interpreted with caution, since the composition of a food is only one of several factors which determine what price the purchaser can afford to pay for it. Thus the one requirement which the farmer cannot, as a rule, entirely meet by means of home-grown foods is the all-important one for albuminoids. Carbohydrates abound in all common farm crops; oils can be largely dispensed with if necessary; but albuminoids can only be replaced to a very limited extent by these other ingredients. Hence the farmer enters the

market with his freedom of choice considerably hampered, and, in order to obtain a sufficiency of albuminoids, may find it necessary to purchase the relatively more expensive foods. It will, indeed, rarely be economical to buy foods rich in carbohydrates and correspondingly poor in albuminoids (*e.g.*, maize) except as substitutes for home-grown grain for the purpose of blending with other foods rich in albuminoids.

Again, the farmer may be so convinced of the superior merits of some particular food, say linseed cake, as to be willing to pay more for it than its composition alone would warrant; or, on the other hand, the demand for certain other foods may, owing to prejudice or other reasons, be so unsatisfactory, or the supply so excessive, as to cause the merchants to offer them at prices which are lower than their composition would seem to justify.

It is, therefore, desirable to select as a standard for purposes of comparison some foodstuff in common use the price of which is little subject to such abnormal influences, and is reasonably steady. In the examples given in the preceding pages linseed cake was used as the basis of comparison. The values arrived at for the other foods will err therefore, if at all, rather upon the high than upon the low side, since the general popularity of linseed cake always assures for it a relatively high price. At the present time Egyptian cotton cake usually serves as an excellent basis for the purposes of comparison.

Spraying with Bordeaux Mixture for Potato Disease.

THE Board of Agriculture and Fisheries desire to draw the attention of potato growers to the importance of spraying their crops with Bordeaux mixture as a protection against potato disease.

In wet seasons spraying is of great value, while even in dry seasons when no disease is apparent the treatment is found to be beneficial, producing a longer period of growth and an increased yield.

The crop should be sprayed twice, and the first spraying should take place as soon as there is a good development of haulm, towards the end of June or early in July, according to the locality and season. About three weeks later the treatment

Full directions for making and applying Bordeaux mixture are given in Leaflet 23 (Potato Disease), copies of which may be obtained on application to the Secretary, Board of Agriculture and Fisheries, Whitehall Place, London, S.W.

The Control of Tuberculosis in Cattle.

WITH the object of obtaining definite recommendations for the control of bovine tuberculosis, the American Veterinary Medical Association appointed in 1909 an international commission on the subject, the report * of which was presented to the Association in September, 1910. The following is a summary of the recommendations made by the Commission, dealing with the dissemination and prevention of tuberculosis, the diagnosis of the disease, the disposition of tuberculous animals, and education and legislation on the subject.

Dissemination and Prevention of Tuberculosis.—As a general policy, it is suggested that all contact between tuberculous and healthy cattle, and between healthy cattle and stables, trucks, &c., which may contain living tubercle bacilli, should be prevented. The following specific recommendations are made:—

(1) There should be no sale or exchange of animals affected with tuberculosis, except for immediate slaughter or for breeding purposes under official supervision.

(2) That preference should be given at live stock shows to cattle known to be free from tuberculosis, and every precaution should also be taken to prevent contact between such animals and those not known to be free from disease.

(3) All live stock shippers should take every precaution to see that trucks in which the animals are conveyed are thoroughly cleansed and disinfected before use.

With the object of preventing the spread of infection, persons buying cattle for breeding purposes or milk production should, except when such purchases are made from disease-free herds which have been tested by a properly qualified person, purchase only subject to the tuberculin test. Moreover, all milk and milk bye-products used as food should

* The Report has since been reprinted as Circular 175 of the U.S. Dept. of Agriculture, Bureau of Animal Industry.

be properly pasteurised unless from cows known to be free from tuberculosis.

None of the methods for the immunisation of animals against tuberculosis are recognised as having passed sufficiently beyond the experimental stage.

Diagnosis of the Disease.—With regard to the tuberculin test the Commission are of opinion that tuberculin, properly used, is an accurate and reliable agent for the diagnosis of active tuberculosis. Tuberculin may not, however, produce a reaction when the disease is in a period of incubation, when the progress of the disease is arrested, or when the disease is extensively generalised. In this last case, detection is usually possible by physical examination, while in the two former cases the disease may sooner or later become active, so that animals which have been exposed to infection should be re-tested with tuberculin every six months. The tuberculin test should not be applied to any animal having a temperature higher than normal. The subcutaneous injection is the only method of making the tuberculin test that is recommended by the Commission; but when an animal has given a positive reaction in any properly conducted test, it should thereafter be regarded as tuberculous, and such reaction should be considered sufficient evidence upon which to declare the herd infected.

The Commission recognises that the discovery of tuberculosis in animals slaughtered for food purposes furnishes one of the best possible means of locating the disease on the farm, and some system of marking should therefore be adopted for purposes of identification.

Method Recommended.—As a general policy in the eradication of tuberculosis, the separation of healthy and diseased animals, and the formation of healthy herds are recommended. If a herd is found to be extensively infected (*i.e.*, 50 per cent. or more of diseased animals), even the apparently healthy animals should be regarded with suspicion until they have been separate from the reacting animals for at least three months. Such a herd should not be treated by the method of general separation. The formation of a new herd from the offspring only is advisable.

In the case of herds containing less than 15 per cent. of

diseased animals, separation of the diseased animals from the healthy animals, and the formation of a sound herd from the healthy animals and the offspring of both are advocated. Herds coming between these figures may be treated by either method at the option of the owner, who should in any case be allowed to reject either method and have his herd dealt with by removal and slaughter of diseased animals. It is recommended that the administrative authority, on becoming aware of the existence of tuberculosis in a herd (to which a policy of slaughter and compensation cannot reasonably be applied), should require the owner to adopt one of the above methods, according to the proportion of diseased animals. If the owner objects his entire herd should be closely quarantined and sales therefrom entirely prohibited. When slaughter is necessary compensation is recommended, and the utilisation, as far as possible, of the meat of such animals as may be found fit for food.

Education and Legislation.—A knowledge on the part of the farmer of the cause and character of the disease, and its methods of dissemination, is necessary if the measures for eradication are to confer the greatest possible benefit; and co-operation should be secured between veterinary surgeons, live stock owners, legislators, and the general public.

Legislation is advocated providing for the compulsory notification by owners and veterinary surgeons of the existence of tuberculosis in a herd. Legislation is especially required to prevent the sale, distribution, or use of tuberculin by any persons other than those acting with the full knowledge or under the direction of official authorities.

Influence of Ventilation on Milk Yield.

THE usual practice in milk production is to keep up the temperature of cow-houses in winter as much as possible. Warmth, however, is only secured by the exclusion of fresh air, the temperature being raised by the heat from the animals' bodies, with the result that the air becomes much polluted. It has been recognised in recent years that this system is likely to be injurious to the health of the animals, and particularly as being conducive to tuber-

culosis. Numerous experiments * have been carried out by the Highland and Agricultural Society of Scotland since 1908 in order to ascertain how far the milk production and the general health of cows are influenced by warmth produced in this way, and whether better results would not be obtained by the free admission of fresh air. The result of these investigations would appear to show that in the temperatures we are accustomed to in Britain too much importance has been attached to heat and too little importance to fresh air. Any benefits which might have been derived from the higher air temperature were nullified by the contaminated condition of the atmosphere, while the greater consumption of food which was expected as the result of the lower temperature has not always been experienced, owing to the healthier condition and better digestion of the animals enjoying the fresh air, which has enabled them to make better use of their food.

The plan followed in these experiments was to erect a complete temporary division across the cow-house, dividing it into two parts, one of which was freely ventilated while in the other the ventilation was arranged so that except in frosty weather the temperature remained steady between 60° and 63° F., and did not exceed 65°. In the winter of 1909–10 the experiment was conducted in five byres in Scotland, all being in fairly open situations. The air space per cow in the byres varied considerably. Among the freely ventilated byres the least space was 525 cubic feet per cow, and the greatest 1,268 cubic feet per cow; the less freely ventilated byres varied in the same way from 480 to 1,432 cubic feet per cow. Taking all the byres, the average space was 843 cubic feet per cow with free ventilation and 839 with restricted ventilation, so that the conditions may be regarded as equal in this respect.

The degree of purity of the air was tested by the proportion of carbon dioxide in samples taken periodically. In this way the air of the byres where the ordinary system of restricted ventilation was in force was found to be much more impure than that of the ventilated byres. In the former, with an average temperature of 57° F., varying from 41° to 69°, the

* *Journal*, October 1909, p. 550, and December 1909, p. 755.

average proportion of carbon dioxide in the air was thirty parts in 10,000, while in the latter, with an average temperature of 49° F., varying from 32° to 65°, the proportion was fifteen parts. It may be added that the difference in the degree of ventilation was very noticeable in practice; and the sensations of an ordinary observer would have led him to expect a more considerable contrast than is shown by these figures. Yet in spite of this the bad ventilation was by no means exceptional, and it is stated that even the worst ventilated of these byres would have seemed cooler and better ventilated than a large number in use throughout the country.

The influence of temperature on milk-yield was not specially considered, as no attempt was made to combine free ventilation with a good temperature kept up by artificial heat. The point investigated was whether in practice it would not be better to ventilate cow-houses freely in winter and ignore the necessarily lower temperature produced, and the result is definitely in favour of ventilation. A comparison of the quantity of milk produced under the two systems showed that the production of milk can be carried on at least as profitably in byres ventilated down to 50° F. as in those in which the temperature is kept ten degrees higher by bad ventilation.

Incidentally it has been brought out—

(1) That any restriction of ventilation sufficient to bring the temperature of a byre up to 60° F. leads to a degree of atmospheric impurity inconsistent with conditions of perfect health.

(2) That in byres in which the temperatures have been kept down by thorough ventilation in autumn, cows do not suffer either in health or milk yield even from very low temperatures in winter.

(3) That whatever waste of food may be entailed in the maintenance of the body-heat of cows in colder byres is more than counteracted by the influence of fresher air; while it is evident that the health of animals is much more likely to be promoted by active digestion than by the mere prevention of loss of body-heat. It should also be observed that the colder temperature in autumn causes the cows to grow and retain thick coats of winter hair; so that it is not even certain that the body-heat is better conserved in the less ventilated

byres than in those which permit the animals to retain their natural coverings.

The practical rules that may be held to arise from the results of these experiments are as follows:—

(1) A careful attempt should be made to give such a degree and kind of ventilation as will, without creating draughts, keep the temperature of the byre always down to 50° F.

(2) Special care should be exercised to keep the temperature of the byre well below this point in autumn and early winter in order that the cows may grow their winter covering of hair.

Eradication of Swine Fever.

A DEPARTMENTAL Committee was appointed on April 11th, 1910, by the President of the Board of Agriculture and Fisheries to inquire into the cause of the continued prevalence of swine fever in Great Britain, and to report whether it is practicable to adopt any further measures with a view to secure its speedy extirpation. This Committee has now presented an interim Report (Cd. 5671. Price 2*d*.).

At an early stage in its investigations, the Committee, after carefully considering the present position of scientific knowledge in relation to swine fever, came to the conclusion that immediate further investigation was desirable into the following matters:—

(*a*) To what extent it is possible for contagion to spread by infective excretions being carried mechanically by attendants and animals other than swine.

(*b*) Whether external parasites, such as certain lice, carry the disease from sick to healthy swine.

(*c*) Whether pigs which have, to all appearance, recovered from swine fever remain long infective to other swine.

(*d*) Whether apparently healthy pigs which have been exposed to infection are capable of transmitting the disease as carriers.

(*e*) For what period it would be safe to consider swine which have recovered from swine fever to be immune against a further attack.

(*f*) What use, if any, could be made of artificial methods of immunisation to expedite the eradication of swine fever.

(*g*) Whether any of the methods which have lately come

into use in connection with other diseases could be employed in the diagnosis of non-typical cases of swine fever.

Experimental work in connection with these questions is in progress, and will form the subject of a subsequent report. The present report deals, therefore, more especially with administrative questions. The Committee state that many criticisms have been offered as to different aspects of the present administration, and various suggestions have been made by witnesses, but both criticisms and suggestions have been of a conflicting and contradictory nature. No case has been made out for any radical change in the administrative machinery now employed by the Board.

The Committee are satisfied that—

(i) The administrative control must remain, as now, in the hands of the central authority—*i.e.*, the Board of Agriculture and Fisheries.

(ii) Restriction on movement, including movement from markets, must continue to form an essential part of any measures adopted to extirpate swine fever.

(iii) The policy of "slaughtering out" in the case of all outbreaks now in force in Scotland and Wales should be applied to the country generally as soon as practicable.

(iv) The present scale of compensation should be maintained.

(v) In the general interest of the industry the size of infected areas should be kept as small as possible, due regard being had to the object in view.

Much ignorance and misconception exists as to the nature of the procedure now employed in the attempt to eradicate swine fever. Cordial co-operation between pig-owners and the authorities, both central and local, is thereby rendered difficult of attainment. Every effort should be made to remove these fruitful sources of friction.

The attention of the Committee has also been called to the confusion arising from the want of uniformity in the printing of licences and declarations required by the Board's Orders. It is important that all local authorities should co-operate cordially with the Board, and should adopt a completely uniform system of procedure with respect to the granting of licences and standard forms, both as regards size and colour, for licences and declarations.

The Committee make the following recommendations:—

(i) In order to extirpate swine fever the policy should be adopted as rapidly as possible under which: (*a*) All swine known to have been, or reasonably suspected of having been, exposed to the contagion of swine fever should be slaughtered, with compensation; (*b*) the movement of swine from markets should be controlled by licence requiring subsequent isolation.

(ii) The whole of the expenditure incurred by the Board of Agriculture and Fisheries should be borne by the Exchequer.

(iii) The general restrictions on the movement of swine should be maintained.

(iv) Article 16 of the Swine Fever Order of 1908 should be made compulsory as regards paragraph (1), which provides (*a*) for the owner of any boar kept for service of sows other than his own keeping a register; (*b*) every pig-dealer keeping a register of purchases and sales; and (*c*) in respect of all carts in which swine are conveyed to markets, sales, or fairs, the carts to be disinfected by the local authority before leaving the market, sale, or fair.

(v) Castrators should be required by the Board to keep registers of their operations.

(vi) The validity of licences for movement should be extended to eight days.

(vii) A completely uniform system of procedure should be adopted by all local authorities, both as regards the granting of licences and the interchange of declarations.

(viii) To secure uniformity, forms required by the Board's Orders should be put on sale by H.M. Stationery Office.

(ix) Steps should be taken by all local authorities to secure the collection of all licences for movement immediately after use.

(x) Insanitary premises on which outbreaks have occurred should be kept closed until the alterations necessary for thorough disinfection and for preventing the danger of the spread of disease in case of the re-introduction of infection have been carried out.

(xi) All swine exposed in markets, sales, and fairs should be inspected by a veterinary inspector employed and paid by the local authority.

Provision of Allotments by Parish and other Councils.

PART II. of the Report of the Land Division* for the year 1910 deals with the proceedings of the Board of Agriculture and Fisheries under the Acts relating to Allotments, Universities and College Estates, Glebe Lands, Improvement of Lands, Settled Land and Agricultural Holdings. Part I., which has been already issued, dealt with the proceedings under the Small Holdings Act.

In accordance with Section 59 of the Small Holdings and Allotments Act, 1908, the Board have called for returns of the proceedings of every Town Council, Urban District Council, and Parish Council in England and Wales in relation to allotments during the year 1910, and the opportunity has been taken to obtain information as to the total quantity of land which is held by the various Councils for allotments, and the number of tenants to whom it is let.

The total number of allotment authorities under the Act is over 8,000, and returns have been received from 7,600 of them. In the great majority of cases, however, the returns showed that no land was held for allotments, no applications had been received, and no proceedings taken. The number of returns which showed that some action had been taken in regard to allotments, either in 1910 or in previous years, was 1,933, 1,500 being from Parish Councils, 277 from Urban District Councils, 155 from Town Councils, and 1 from the London County Council.

The total quantity of land let for the purpose of allotments by the various Local Authorities in England and Wales on December 31st, 1910, was 27,838 acres, of which 6,094 acres were the property of the Councils, and 21,744 acres were leased. This land is let to 100,498 individual tenants and 21 Associations.

In rural parishes it is usually possible to obtain allotments from private landowners direct, and there is, therefore, no need for the intervention of the Parish Council, but in large towns this is less often the case, and it is, therefore, satisfactory to notice that out of the 73 County Boroughs in England and Wales allotments have been provided by the Town Councils in 41 of them.

* Cd. 5648. Price 3d.

Applications were received for allotments during 1910 from 15,647 individuals and 7 Associations, and the total quantity applied for was 4,436 acres. Allotment authorities are empowered by the Act to erect dwelling houses for occupation with any allotment of one acre or more, and 33 applications for houses were received during the year, but at present none have been actually erected by any of the authorities.

The returns received show that 1,582 acres have been acquired for allotments during the year 1910, as compared with 2,407 acres in 1909. The quantity purchased is 250 acres, and the price paid £23,569; while the quantity leased is 1,332 acres, for which rents amounting to £2,958 are paid. The average price of the land purchased is £105 an acre, and the average rent of the land leased £2 4*s*. 6*d*. an acre.

There were 4,979 individual applicants and 5 Associations in England and Wales provided with allotments by local authorities on the land acquired during 1910, and in addition a large number of applicants have been provided with allotments on land which was acquired before 1910. The returns received show that there is at present an outstanding demand, which has not been satisfied, from 11,214 individual applicants and 11 Associations, and that the quantity of land required to satisfy them is 4,974 acres.

SUMMARY OF AGRICULTURAL EXPERIMENTS.*

SOILS AND MANURING.

Composition of Gas Lime (*Jour. Agric. Science, Vol. iii., Pt.* 3, *September,* 1910).—Analyses of two samples of gas lime were made by Mr. P. J. Bhatt in the laboratory of Cambridge University Department of Agriculture. One sample was described as carbonised lime, and was shown by its analysis to be practically moist calcium carbonate. The second sample was described as sulphided lime. This contained small but definite quantities of free sulphur, sulphur compounds, and cyanides, which might be harmful to crops or possess some fungicidal power. To test these points, growing cress and clover were treated with solutions of both samples at various strengths. In the weaker solutions no action was observed, but with a 10 per cent. solution a distinct check on the growth took place, especially in the case of the sulphided lime. Neither material, however, seemed likely to be dangerously

* A summary of all reports on agricultural experiments and investigations recently received will be given each month. The Board are anxious to obtain for inclusion copies of reports on all inquiries, whether carried out by agricultural colleges, societies, or private persons.

poisonous to crops growing on land to which it might be applied. The sulphided lime was found to have some fungicidal power, 10 per cent. solutions preventing spores from germinating, but its fungicidal properties did not seem strong enough to give it any practical value. The solutions of carbonated lime had no appreciable effect on the germination and rate of growth of the spores.

Composition of Soot (*Jour. Agric. Science, Vol. iii., Pt.* 4, *December*, 1910).—The value of soot as a manure depends upon the ammonia contained in it, as well as upon its beneficial effect on the texture of the soil, and its power of diminishing the attacks of slugs and snails. The quantity of ammonia or nitrogen in soot, however, varies greatly, and this investigation was carried out by Mr. H. W. Harvey, of Cambridge University Department of Agriculture, in order to throw some light on the relation between the general characteristics of soot and its nitrogen content. One sample of soot from a kitchen chimney was found to contain 11·0 per cent. of nitrogen, and weighed 9 lb. per bushel, loosely packed. In the other samples from dwelling-houses the nitrogen varied from 5·5 to 2·7 per cent., and the weight from 18½ to 33 lb. per bushel, the lighter soots usually containing the greater proportion of nitrogen. Thus the general opinion of farmers that a light soot is best is well borne out. Owing to this, the safer method would be to buy soot by volume instead of by weight, as the buyer will then be likely to get an approximately constant quantity of nitrogen per bushel. Most of the samples mentioned contained approximately 1 lb. of nitrogen per bushel, and the soot would be worth about 6*d*. per bushel for its fertilising value alone, apart from its action on the soil or on insect pests.

A sample of flue dust from a 40 ft. boiler shaft contained only 0·5 per cent. of nitrogen. This sample was of a reddish colour, but the colour alone could not be relied upon to show its nature, since a sample from a kitchen chimney with 5·4 per cent. of nitrogen also had a distinctly reddish tinge. Flue dust from the Cambridge Rubbish Destructor, similar to that from the London Destructors which is used extensively upon the hop-fields of Kent, contained no nitrogen, and was composed almost entirely of inorganic matter, mostly oxides of aluminium and iron with calcium carbonate.

Calcium Cyanamide and Nitrate of Lime (*Lancs. C.C. Educ. Com. Agric. Dept., Farmers' Bul. No.* 20).—The four nitrogenous manures, nitrate of soda, sulphate of ammonia, calcium cyanamide or nitrolim, and nitrate of lime, were used in 1910 on oats, mangolds, and potatoes. The nitrogen contained in each was as follows :—

Sulphate of ammonia (24 per cent. ammonia)	20 per cent.
Nitrate of soda (95 per cent. purity)	15½ ,,
Calcium cyanamide	18 to 20 ,,
Nitrate of lime	13½ ,,

They were applied in quantities containing approximately equal amounts of nitrogen, and the results appeared to show that the same amount of nitrogen in any of the four forms is equally effective for crop production. The extension of the use of the two new manures will therefore depend largely upon the price per unit of nitrogen contained in them. Both are less convenient to handle than the older manures, calcium cyanamide being very light and dusty, and liable to cause injury

to young and tender plants, while nitrate of lime absorbs moisture very readily, and becomes difficult to sow.

Liming of Meadow Land (*Lancs. C.C. Educ. Com. Agric. Dept., Farmers' Bul. No. 17*).—These experiments have been carried out since 1906 to ascertain whether ground limestone could be substituted for cob-lime and ground-lime. Both these when used upon the land become changed into carbonate of lime, and if finely ground limestone or carbonate of lime could be used instead, the expensive process of burning the rock could be dispensed with. A ton of cob or ground lime is converted by exposure to the air into 1¾ tons of carbonate of lime, so that in the trials 1¾ tons of ground limestone were used in comparison with one ton of each of the other forms. In spite of this, the cost of the dressing of ground limestone was, owing to its low price, at first less than that of cob-lime or ground-lime: but its price has steadily risen since 1906, and in 1910 the cost per acre of each application was: cob lime, 14*s.* 8*d.*; ground lime, 20*s.* 8*d.*; ground limestone, 17*s.* 6*d.* In the four seasons, 1906 to 1909, the plot on which ground limestone was used has produced the heaviest crop of hay; and when the cost of the liming is taken into account, this has been the most profitable form to use. It is concluded that this is a quite suitable form in which to apply lime. It has given the most remunerative results up to the present, but as the price has been gradually rising, farmers may later find it more profitable to use one of the other forms. It is recommended that the ground limestone used should contain at least 95 per cent. of carbonate of lime, and should be finely ground, not less than 40 per cent. passing through a sieve having 10,000 holes to the square inch. Samples more finely ground can be obtained, but they are more costly.

Manuring of Potatoes (*Hereford C.C. Agric. Educ. Sub-Com., Farmers' Bulletin, No. 2*).—The experiment sought to ascertain the effect of omitting potash from a complete dressing of artificials for potatoes and the effect of replacing pure sulphate of potash (50 per cent. potash) by potash manure salts (31 per cent. potash), these salts having given good results in Scotland. The values of sulphate of ammonia and nitrate of lime as sources of nitrogen were also compared.

A dressing of about 12 tons of farmyard manure was given in each case. Sulphate of potash proved superior to potash manure salts, the increased yield from the dressings containing these being 2 tons 19 cwt., and 2 tons 5 cwt. respectively. Nitrate of lime was found more effective than sulphate of ammonia, the increased yields being 3 tons 12¼ cwt. and 2 tons 5 cwt. respectively. The omission of potash from the dressing resulted in an average reduction of 26 cwt. of potatoes per acre. The artificials used in each case gave a profitable return varying in amount from £1 17*s.* 9*d.* to £5 9*s.* 9*d.* per acre.

Manuring of Mangolds (*Hereford C.C. Agric. Educ. Sub-Com., Farmers' Bulletin, No. 3*).—Good results were obtained in 1908 and 1909 from the use of salt for mangolds, 3 cwt. of salt per acre having increased the yield by 3 tons per acre. In 1910 the trials were intended to test this point further, and, in addition, to ascertain the effect of nitrate of lime, and the results of using phosphates from two sources (superphosphate and bone flour) as compared with the use of superphosphate alone in the dressing.

The addition of 3 cwt. of salt to the dressing again increased the yield by 3 tons per acre. The increase due to the addition of nitrate of lime to the dressing was 1 ton 10 cwt., or a profit of £2 0*s.* 8*d.*, as compared with £1 2*s.* 8*d.* on the plot on which it was omitted. A dressing which contained 3 cwt. superphosphate and 1 cwt. bone flour was found much more effective than one containing 4 cwt. superphosphate, the increased yields over the unmanured plot being 6 tons 17½ cwt. and 5 tons 7 cwt., or a profit of £2 compared with £1 2*s.* 8*d.*

Manuring of Swedes (*Hereford C.C. Agric. Educ. Sub-Com., Farmers' Bulletin, No.* 4).—The objects of this experiment in 1910 were to compare nitrate of soda and sulphate of ammonia in a complete dressing of artificials for swedes to ascertain whether phosphates from one source would give better results than phosphates from two sources, and to find the effect of omitting potash from the dressing.

The mixture containing nitrate of soda did not yield so profitable a return as that containing sulphate of ammonia. Superphosphate alone gave a larger yield than superphosphate and bone flour or superphosphate and basic slag. The swedes grown on the plots receiving basic slag, however, were brighter-looking and suffered less from finger-and-toe than those receiving superphosphate alone. The result of including sulphate of potash in the dressing was to increase the yield by 18½ cwt. per acre, which more than met the cost of this ingredient in the manure. The dressing which gave the greatest yield was ½ cwt. sulphate of ammonia, 6 cwt. superphosphate, and ½ cwt. sulphate of potash per acre.

Manuring of Meadow Hay (*Hereford C.C. Agric. Educ. Sub-Com., Farmers' Bulletin, No.* 5).—Experiments have been carried out at two centres since 1906 on manuring meadow hay with farmyard manure (about 10 tons per acre), and complete and incomplete mixtures of artificials. The soil is deficient in lime, and in 1910 sub-plots were dressed with lime at the rate of 3 tons per acre.

The lime was applied rather late in 1910, but, in spite of its slow action, there was, on cutting in July, a net increase of 1¼ cwt. per acre on the limed over the unlimed plots. With regard to the effects of incomplete mixtures of artificials, the omission of phosphates caused the greatest diminution in the yield, then nitrogen, and lastly potash. It is recommended, therefore, that potash should only occupy a small proportion of the mixture, say not more than ½ cwt. sulphate of potash per acre. A complete mixture of artificials gave an average increase of 10½ cwt. of hay, with a profit of 7*s.* 6*d.* per acre over the unmanured plot. The most successful dressing used in the experiments was one of 10 tons of farmyard manure in alternate years, with 102 lb. sulphate of ammonia and 352 lb. superphosphate in the years when no farmyard manure was applied. This dressing gave an average crop of 43¼ cwt., or 16¾ cwt. more than the unmanured plot.

FIELD CROPS.

Varieties of Oats (*Lancs. C.C. Agric. Dept., Farmers' Bulletin No.* 18).—In 1909 trials were made of Waverley (local and Irish seed), Mounted Police, Banner, Wide Awake, and Besseler's Prolific, the seed-

ing per acre being 5 bushels, and in 1910 of Banner, Wide Awake, Beseler's Prolific, Goldfinder, Abundance, and Thousand Dollar, the seeding varying from 5 to 5½ bushels. The oat crop in most cases followed first or second year's lea, but in one instance was preceded by a crop of cabbage. The dates of sowing varied slightly, according to district, but the different varieties at the same centre were sown at the same time. On one or two farms a light dressing of nitrate of soda was given as a top dressing, but in the majority of cases no manure was applied.

The varieties which brairded early were also found to ripen early, Abundance being invariably among the earliest, while Goldfinder was usually very late. In the case of Waverley, Irish seed yielded better than English seed—54 bushels of grain per acre as compared with 46½ bushels per acre—and also gave a higher percentage of meal on milling. Beseler's Prolific gave the heaviest average yield of corn but ripened latest. There was little to choose between Banner and Wide Awake, both being early, tillering well, and producing the best quality of grain and straw. The results of the milling test gave Wide Awake 1,653 lb. meal per acre, and Banner 1,568 lb. per acre. Abundance compared favourably with the other varieties, but Goldfinder was a failure. Thousand Dollar proved an early oat of excellent quality and a moderate yielder.

Varieties of Mangolds and Swedes (*Midland Agric. and Dairy Coll., Buls.* 5 *and* 6, 1910–11).—Eight varieties of mangolds were grown on six different farms in the Midlands, each farmer following his own method of cultivation. The percentage of dry matter in each variety was tested, so that their feeding value could be more exactly compared by the total weight of dry matter produced per acre than by the crop. Compared in this way the best varieties were:—

	Total dry matter per acre. lb.	Crop per acre. tons cwt.
Golden Tankard	6,939	27 8
Lion Intermediate	*6,845*	*32 13*
Prizetaker	6,778	29 19
Windsor Globe	6,664	29 15

It will be seen that this year the greatest amount of dry matter was not produced by the variety with the heaviest yield. The number of "bolters" in each variety was noticed. In this respect the worst were Red Emperor, Red Intermediate, and Golden Tankard; Windsor Globe and Prizetaker were intermediate, and Normanton Globe, Lion Intermediate, and Prizewinner were almost free.

In the swede trials ten varieties, mostly bronze-tops, were grown on six farms. The differences between the varieties were not large, but the following were the best four, judged by the total quantity of dry matter produced:—

	Total dry matter per acre. lb.	Crop per acre. tons cwt.
Golden Melon	5,336	23 6
Magnum Bonum	5,206	22 4
Extra Improved Purple Top ...	5,165	21 4
Darlington	5,111	21 19

WEEDS AND INSECT AND FUNGUS PESTS.

Destruction of Charlock by Chemical Means (*Mitteilungen der Deut. Landw. Gesell., April 29th,* 1911, *Flugblatt, No.* 11).—The destruction of charlock (*Sinapis arvensis,* L.) and wild radish (*Raphanus Raphanistrum,* L.) is most effectively carried out by mechanical means, *e.g.,* harrowing. Where such methods are inapplicable, or where they have not proved successful, the German Agricultural Society recommends the eradication of the weeds by chemical means. The method which has been found in Germany to be the best and cheapest is to spray the weeds with a solution of sulphate of iron at the rate of about 54 gallons of a 15 to 20 per cent. solution (¾ cwt. to 1 cwt. sulphate of iron) per acre. Smaller quantities will not ensure success, but larger quantities will do no harm. The addition of 5 per cent. of molasses is also recommended as causing the solution to adhere to the weeds more firmly. Care should be taken in the choice of a sprayer and the regular cleansing of the same.

Sulphate of iron applied in the form of a powder, whether as crystals or dried, is also effective if sufficient quantities are used (say 90 lb. per acre of the dry form, or 180 lb. per acre of the crystalline form), if the powder is evenly distributed, and if it is applied when the leaves are wet with dew. Its application is therefore only possible in the early morning in calm weather. Distribution by hand is difficult, and manure distributing machines should be used. Nitrate of lime is also effective in destroying charlock, but on account of its cost it should only be used where the crop under cultivation needs nitrogenous manuring. It should be applied at the rate of 90 lb. per acre.

All cereals may without hesitation be sprayed or powdered with sulphate of iron. The slight damage apparent at the commencement is unimportant, and as a rule further growth is favourably influenced. Clover, lucerne, and seradella sown among the grain crops will also stand the treatment. On the other hand, roots, potatoes, beans, vetches, and yellow and white lupins are injured, but peas and blue lupins are more resistant. Flax can also be sprayed if about 4 in. high.

The success of the treatment depends upon the time of spraying. The standing stems of the older weeds and their buds are not destroyed, and treatment should therefore take place before the appearance of the buds about the time the fourth leaf develops. Spraying should not be carried out when the plants are wet with rain or dew, or when rain is expected, but otherwise it may be undertaken at any time of the day, though cold or windy weather is prejudicial to the effectiveness of the operation.

Remedies for Apple Sucker.—In addition to the methods recommended in Leaflet 16 to be employed against Apple Sucker (*Psylla mali*), one of the Board's inspectors has found two remedies very useful during the last few years. These are respectively a nicotine wash of strength about 0·075 per cent., and a lime-and-salt wash containing 20 per cent. of lime and 2 per cent. of salt.

The nicotine wash has proved superior to paraffin emulsion, and is absolutely innocuous to leaves and flowers. It should be used after the young begin to hatch out. A solution of this strength was found

very successful at Woburn in 1908, 99 per cent. of the Psylla being killed in the case of ten dwarf apple trees sprayed on May 17th, when the blossom buds were just open. The wash does not appear to be injurious to bees.

The lime-and-salt wash should be applied in the middle of March or even later. Theobald* recommends its application between the time of the opening of the buds and about two weeks beforehand. The action of the wash is described as forming a coating over the egg and so preventing the breaking of the shell and the escape of the young insect. Trees that have not borne fruit for several years have yielded after the use of this wash.

Sclerotinia Disease of the Mangold.—The Board have received an interesting note on the *Sclerotinia* disease of the mangold from Mr. Milburn, Ph.D., Secretary of Agriculture for the Education Department of the Lancashire County Council. This disease was referred to in this *Journal*, April, 1911, p. 45, as having been identified by Mr. Salmon, at the South-Eastern Agricultural College, Wye.

Mr. Milburn states that he first noticed the disease at Normanton Grange, Loughborough, in 1906. Several loads of mangolds lay in the farmyard, and almost every bulb had the black, button-like sclerotia on it; in fact, so numerous were they that the whole heap had a blackened appearance. Some were in the last stages of decay, but the bulk of them had one or two sclerotia in little "pits," or hollows, caused by the pecking of pheasants or the biting of slugs, while growing, round the bulb at the soil level. There was in these cases a blackening of the tissues in the immediate neighbourhood of the "pit." The matter was recorded in two occasions in the annual report of the Midland Agricultural College, and a specimen piece of mangold with the sclerotia in the "pits" is preserved at the College in spirit.

Mr. Milburn is of opinion that the disease is far more prevalent than is generally thought. In the mangolds of the Midland Agricultural College it has been observed annually; in fact, on close examination, few clamps are found entirely free. In view of the damage done by the above fungus, the practice of loading mangolds into carts by means of a fork, which breaks the skin and gives easy access to the fungus, is strongly to be deprecated.

Swedes, too, suffer from this disease, but not to the same extent as mangolds.

Use of Carbon Bisulphide as a Remedy for Eelworm (*Bulletin of Miscellaneous Information, Kew, No.* 3, 1911).—With a view to testing the accuracy of the statement that eelworm is killed by carbon bisulphide, as well as to ascertain the action of this substance on plants, some experiments have been carried out at Kew on plants in pots. In every experiment the carbon bisulphide was introduced into the soil through the drainage hole at the bottom of the pot by pouring it on the "crocks" so that it did not come in contact with the root of the plant in liquid form.

A *Begonia*, the roots of which were infested with a parasitic worm, *Fridericia bisetosa*, Levinson, was so treated with one dram of carbon

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* Report on Economic Zoology, 1907. See also *Journal*, vol. xviii, April, 1911, p. 48.

bisulphide. Three days after treatment, the lower leaves commenced to wilt and bleach, and at the end of a week all the fully-grown leaves were quite colourless, and collapsed. At this stage the plant was removed, and all the worms were found to be dead. Six different varieties of healthy *Pelargonium* were treated, three with one dram and three with half a dram each of carbon bisulphide. After three days the lower leaves in each case were very flaccid and almost bleached, and after a week all the full-grown leaves on every plant were bleached and dead. The plants were not, however, killed outright. On the other hand, a *Begonia* and a *Ulex*, each treated with three drops of carbon bisulphide, were not injured.

The experiments suggest that it would not be wise to attempt the treatment of pot plants in vigorous growth with carbon bisulphide with the object of eradicating eelworm, &c., but a precaution that may usefully be taken is to treat all leaf soil, dung, &c., before use, as *F. bisetosa* probably finds its way into the soil used by gardeners from such sources.

HORTICULTURE, CIDER, AND HOPS.

Classification of Varieties of Cider Apples (*National Fruit and Cider Institute, Report,* 1909).—During the season of 1908–9 the making of cider and perry from individual varieties of fruit was continued. The chemical composition, rate of fermentation, and a description of the quality and characteristics of each are given. From the facts ascertained by these experiments, it has been found possible to classify the varieties into a number of groups, each of which may be represented by a more or less well-known variety as the type, and the method of treatment recommended for this sort may be taken as suitable for the other individual members of the same group. To give an example, one of the three main classes of cider apples, the "sharps" or "sours," may be divided up into a series of groups, represented respectively by Cap of Liberty, Kingston Black, Fair Maid of Devon, and Underleaf, with others which need not here be specified, as the type varieties. The Cap of Liberty group is normally characterised by the juice containing a comparatively large percentage of malic acid and a moderately large percentage of tannin, and fermenting also at a comparatively slow rate. Apples of this group are adapted for the production of a sweet cider of good quality after suitable blending. The kind of blending required is the addition of about equal parts of a variety of the class of "sweet" apples, belonging to a slow-fermenting group—which may be typified by Sweet Alford—and of a variety of a slow-fermenting, pronounced "bitter-sweet" type—of which Royal Jersey or Strawberry Norman may be quoted as examples; or an equally satisfactory blending may be obtained by the use of about two parts of a slow-fermenting, mild "bitter-sweet" apple of the Horner type.

A great difficulty met with in this connection is the differences shown by a variety in different seasons and conditions of soil, &c. A variety is on the average fairly consistent in behaviour and characters, but any particular sample may show great differences from the normal type in the degree of acidity, astringency, and sweetness of the juice, and also in the rate of fermentation, and the flavour and body of the mature cider. Since it has been shown in former years at the Institute that

the dominant factor in determining the quality of a cider is the quality of the fruit, the importance of the factors which cause these differences in the quality of the fruit is evident, and an investigation of them is being carried out. Among the most important of these factors are soil, climate, the vigour of the tree, and ripeness.

Influence of Grass on Fruit Trees (*National Fruit and Cider Inst., Report, 1909*).—*The injurious effect of grass growing* round fruit trees is well established, but an experiment has been begun to ascertain whether the gain in growth is sufficient to pay for the labour necessary to keep an area round each tree free from grass. Circles of 9 ft. and 6 ft. in diameter have been kept free from grass round the stems of apple trees of eight varieties since planting, and the effect produced has been measured by the diameter of the stems. The most interesting feature at present is that the advantage of the 9 ft. area over the 6 ft. area was almost entirely in the first two years that measurements were taken, *i.e.*, the third and fourth years after planting. Each year there has been an appreciable gain with both free areas over the trees planted in grass land, but in the fifth and sixth years after planting it has only been enough to justify the labour of keeping the smaller area free. This leads to the suggestion that instead of planting directly in grass land, as is customary, the better plan may prove to be to plant in cultivated land, which may afterwards be sown to grass, since apparently it is during the first season or two after planting that the tree reaps most benefit from the absence of grass in its proximity.

Young or Old Trees for Planting (*National Fruit and Cider Institute, Report,* 1909).—From the trees that were used in the above experiment, some conclusions are drawn as to the amount of loss in growth that results from planting large trees, up to seven or eight years old from the time of grafting. The trees ranged from three to seven or eight years old when planted. No measurements were made until 1906, two years after planting, but it may be assumed that the larger trees at that time were larger when planted, the difference in most cases being considerable. The percentage growths made by 1909 are given in the report, and it is shown that in nearly all cases the best growths were made by the trees that were smallest in 1906, and therefore presumably at planting. The significance of the results is increased by the fact that the older trees were varieties that are usually the strongest growers at the Institute, while the younger ones, which made the best growth, are the weakest growers there.

Strawberry Runner Experiments (*National Fruit and Cider Institute, Report,* 1909.)—These trials were started in 1906, and have now been completed. The "first" runner is the first produced from the parent plant on a given stem, and the "second" is the next produced on the same stem. A larger yield has been obtained from the firsts in all three years 1907–9, and the difference in the last year was more pronounced than in either of the two previous years, so that the result is not merely on account of the "seconds," which, as might be expected, were more backward at the start, taking longer to reach full vigour. The total crop for the three years with five different varieties of strawberries was 1,517 lb. from "first" runners, and 1,207 lb. from "second" runners. Taking the varieties separately, President gave the greatest difference; while Royal Sovereign and Latest of All

gave results definitely in favour of the "first" runners. There was a slight balance in favour of the "first" in the case of Monarch, but Paxton's gave practically the same yield for both sets. There is therefore good evidence that "first" runners tend to be more fruitful than "second," and there is a sufficient margin of difference in the yields to make it a matter of practical importance to the grower to select only "first" runners for planting.

Pruning of Gooseberries (*National Fruit and Cider Institute, Report,* 1909).—Gooseberry bushes planted in 1905 have been since 1908 pruned on the "hard" and "light" systems respectively. In the "hard" system, which is usual outside fruit-growing areas, the leading shoots are clipped back fairly hard, and the laterals still harder, so that the bush becomes round and dense. In the "light" system the leading shoots are not cut back so closely, while the laterals are more reduced than in the other system. The result is a comparatively straggling and open bush. Ease and economy of time in gathering the fruit, and an improved quality of berry are the advantages claimed for the light system. The effect on the crop is disputed, and this experiment is intended to deal with the point. Before 1908 all the bushes were pruned on the hard system. Since then the crop for two years has been 1,531 lb. with the "hard" system, and 1,404 lb. with the "light," while the berries in the latter case have been superior in quality. The economy of labour and time is found to be markedly in favour of light pruning, and if the crops continue as they have begun there will be no doubt which is the more profitable system for the grower.

Breeding of Hardy Apples in Canada (*Central Experimental Farm, Canada, Bulletin No.* 68).—This bulletin contains an account of the investigations carried out by the Canadian Department of Agriculture as to the breeding of hardy apple trees in the north-western provinces of Manitoba and Saskatchewan.

In 1887 young trees were raised from the seed of a small wild Siberian crab-apple, *Pyrus baccata,* obtained from the Imperial Botanic Gardens, St. Petersburg, and as soon as they were large enough for transplanting were sent to the north-west, where they have since proved entirely hardy, and have fruited abundantly for many years. The fruit, in its unimproved form, however, is not of much use, the apples being not much larger than a cherry, and having an astringent taste. The work of cross-breeding was begun in 1894, in which year efforts were made to improve the size and quality by cross-fertilising the flowers of *P. baccata* with pollen from many of the hardiest and best varieties of apples grown in Ontario. Trees from the seeds of these crosses have been planted from year to year at Ottawa, and various north-western stations. Thirty-six of the cross-bred apples fruited in the fourth year from the sowing of the seed, and since then several hundred more have borne fruit, and the number of varieties worthy of extended cultivation has been considerably increased. Root grafts of some of the more promising sorts were early made, and have also proved hardy. The larger of the new cross-bred varieties are from twelve to fourteen times heavier than *P. baccata.*

Crosses were begun in 1896 on another variety of wild crab, *P. prunifolia,* the fruit of which is about twice the size of *P. baccata,* and in 1902

on the wild apple of Europe, *P. malus*, the fruit of which is about an inch in diameter and of fair quality. The hardiness of both these varieties has been established. Many of the best crosses on *P. baccata* and *P. prunifolia* have been recrossed in the hope of obtaining fruits of larger size and better quality, but there is as yet not much proof that they are sufficiently hardy to endure the climate of the north-west.

A list of the crosses of *P. baccata* and *P. prunifolia* is given in the bulletin, together with the size and quality of the fruit in each case.

OFFICIAL CIRCULARS AND NOTICES.

Prevalence of Animal Diseases on the Continent.

The following statement shows that, according to the information in the possession of the Board on June 1st, 1911, certain diseases of animals existed in the countries specified:—

Austria (week ending May 17th).
Anthrax, Sheep-scab, Swine Erysipelas, Foot and Mouth Disease (166 Höfe).

Belgium (fifteen days ending April 30th).
Anthrax, Blackleg, Foot-rot, Rabies.

Bulgaria (nine days ending May 7th).
Blackleg, Glanders and Farcy, Rabies, Sheep-pox, Sheep-scab, Swine-fever.

Denmark (month of April).
Anthrax, Foot-rot, Swine Erysipelas, Foot and Mouth Disease (one case).

France (month of April).
Anthrax, Blackleg, Glanders and Farcy, Rabies, Sheep-pox, Sheep-scab, Swine Erysipelas, Swine-fever.
Foot and Mouth Disease (216 "étables" in 119 "communes").

Germany (on May 15th).
Glanders and Farcy, Swine-fever, Foot and Mouth Disease (12,394 infected places in 3,224 parishes).

Holland (month of March).
Anthrax, Foot-rot, Swine Erysipelas, Foot and Mouth Disease (138 outbreaks in 9 provinces).

Hungary (on May 10th).
Anthrax, Sheep-scab, Swine Erysipelas, Swine-fever, Foot and Mouth Disease (61 "cours").

Italy (week ending April 2nd).
Anthrax, Blackleg, Glanders and Farcy, Rabies, Sheep-scab, Swine Erysipelas, Foot and Mouth Disease (1,068 cases entailing 16,408 animals).

Montenegro (sixteen days ending April 15th).
Foot and Mouth Disease (54 provinces infected entailing 484 animals).

Norway (month of April).
Anthrax, Blackleg.

Roumania (nine days ending May 13th).
Anthrax, Dourine, Glanders and Farcy, Pleuro-pneumonia, Rabies, Sheep-pox, Swine Erysipelas, Foot and Mouth Disease (4 cases in 1 "commune").

Russia (month of January).

Anthrax, Cattle-plague, Glanders and Farcy, Pleuro-pneumonia, Rabies, Sheep-pox, Swine Erysipelas, Swine-fever, Foot and Mouth Disease (30,147 cases in 524 "communes").

Servia (eight days ending May 13th).

Rabies, Swine-fever, Foot and Mouth Disease (221 cases in 23 "communes").

Spain (month of March).

Anthrax, Blackleg, Dourine, Glanders and Farcy, Rabies, Sheep-pox, Sheep-scab, Swine Erysipelas, Tuberculosis.

Sweden (month of April).

Anthrax, Blackleg, Swine Erysipelas, Swine-fever.

Switzerland (week ending May 21st).

Anthrax, Blackleg, Rabies, Swine Erysipelas, Foot and Mouth Disease (46 cases entailing 404 animals, of which 5 cases were declared during the week).

County Committees for the Encouragement of the Horse-breeding Industry.

The President of the Board of Agriculture and Fisheries is appointing Committees in each county for the purpose of assisting the Board in all matters pertaining to the encouragement and improvement of the horse-breeding industry. The members of these committees are nominated by the Chairmen and Conveners of the County Councils, and are gentlemen having an intimate acquaintance with the industry of horse-breeding, and with their assistance and co-operation the Board hope to ascertain in the fullest manner all necessary details as to the character and extent of the industry in the localities which they represent.

The names and addresses of the gentlemen forming the Committees in the following counties were given in the *Journal* for April (p. 58):—Cumberland, Gloucester, Hereford, Isle of Wight, Northampton, Rutland, Salop, E. Sussex, W. Sussex, Staffs, Westmorland, Worcester, Yorks (E. R.), Brecknock, Carmarthen, Denbigh, Monmouth, Radnor, Argyll, Bute, Dumharton, and Renfrew; and those in the following counties were given in the *Journal* for May (p. 151):—Bedford, Berks, Bucks, Cambridge, Chester, Cornwall, Derby, Devon, Dorset, Durham, Essex, Hants, Hertford, Huntingdon, Isle of Ely, Kent, Lancaster, Leicester, Holland (Lincs.), Kesteven (Lincs.), Lindsey (Lincs.), Middlesex, Norfolk, Northumberland, Nottingham, Oxford, Somerset, East and West Suffolk, Warwick, Wilts, Yorks (W. R.), Yorks (N. R.), Anglesey, Carnarvon, Flint, Merioneth, Montgomery, Pembroke, Aberdeen, Ayr, Banff, Berwicks., Caithness, Clackmannan, Dumfries, Fife, Forfar, Inverness, Lanark, Kincardine, Kirkcudbright, Midlothian and Linlithgow, Nairn, Roxburgh and Selkirk, Shetland, Stirling, and Sutherland. Committees have also been appointed for the following counties:—

The Soke of Peterborough.

The Marquess of Exeter, Burghley Estate Office, Stamford.
W. G. Maxwell, Longthorpe, Peterborough.
G. C. Wentworth-Fitzwilliam, Milton, Peterborough.
Secretary, Thomas H. Walker, Queen Street, Peterborough.

Orkney.

A. Baikie, Hall of Sankerness, near Kirkwall.
J. Clouston, Groemshall, St. Mary's, Holm.
J. Garrioch, Tingwall, Rendall, Kirkwall.
J. Mackay, Stromness Hotel, Stromness.
J. Robertson, Tufta, Harray, Stromness.
Robert Scarth, Binscarth, by Finstown.
A. Skea, Aikerskaill, Deerness, Kirkwall.
J. Wishart, Westquoy, Orphir, Kirkwall.
Secretary, Duncan J. Robertson, Clerk to the County Council, Kirkwall.

American Gooseberry Mildew. Warning.

The Board of Agriculture and Fisheries have received information that the summer stage of American Gooseberry Mildew (*Sphærotheca Mors uvæ*) was discovered in two Cambridgeshire gardens on May 8th. All gooseberry growers are advised to examine their bushes carefully, and should any sign of disease be found to spray their bushes with a solution of liver of sulphur (one pound to 32 gallons of water). A leaflet describing the disease and giving directions for dealing with it can be obtained from the Secretary, Board of Agriculture and Fisheries, 4 Whitehall Place, London, S.W., gratis and post free. Letters so addressed need not be stamped.

Growers are reminded that by Article 3 of the American Gooseberry Mildew Order of 1909 they are required to report the presence of this disease on their premises to the Board or the Clerk of the Local Authority for the district, either directly or through an Inspector, and that the failure to report is punishable by a fine.

Small Holdings Act. Compensation for Termination of Tenancy.

The Board have addressed the following Circular, dated May 22nd, to County Councils and Councils of County Boroughs in England and Wales, on the subject of the payment of compensation for the termination of a tenancy of land under the Small Holdings Act, 1910:—

SIR,—I am directed by the Board of Agriculture and Fisheries to advert to their circular letter of the 15th August, 1910 (A.189/C)* as to the procedure to be adopted in dealing with claims for compensation under the above-named Act, and I am to say that the experience which the Board have gained in investigating the claims which have been made under section 2 of the Act has shown that considerable misconception exists as to the scope of the compensation payable under the Act. The Board think it desirable, therefore, to issue some further instructions with the object of securing greater uniformity in dealing with claims.

In view of the fact that any compensation paid by a Council under an award or with the consent or approval of the Board and any expenses which in the opinion of the Board have been necessarily or

* See *Journal*, September, 1910, p. 496.

reasonably incurred by the Council in relation to a claim are repayable by the Board out of the Small Holdings account, the Board are of opinion that the most convenient course will be that they should take over the work of adjusting the claims, and, failing agreement, of appearing before the Arbitrator. This will enable the officers of the Board to deal with the claims on uniform lines, and will avoid unnecessary duplication of work. The Board think, however, that Councils should continue to be responsible for making the valuation of the goods, implements, produce, and stock proposed to be sold, and that their officers should assist the officers of the Board in the investigation of the claim.

I am, therefore, to ask that a copy of any claim or of any notice of intention to make a claim should be sent to the Board as soon as it is received by the Council, together with information as to whether the notice to quit was given by the Council or by the landlord at the request of the Council. The Board should also be informed of the date on which the tenancy in respect of which the claim is made has terminated or will terminate. The Board will then ask the Council to make a valuation of the goods, implements, &c., proposed to be sold, and after the sale has taken place, to obtain a priced catalogue showing the sums realised. A copy of the valuation and catalogue should then be sent to the Board, who will instruct one of their officers to deal with the claim and to endeavour to arrive at a settlement. If a settlement is effected, the sum payable will be communicated by the Board to the Council, with a request that the Council will pay it and include the amount together with any incidental expenses in their next claim for repayment by the Board. If the claimant refuses to accept the sum offered by the Board, the question will be referred to arbitration, and an officer of the Board will conduct the case before the Arbitrator on behalf of the Council. The sum awarded, together with any costs of the arbitration, will then be paid by the Council and recovered in due course from the Board.

I am to add that although claims under the Act are valid if made within three months of the termination of the tenancy, it is provided by the Act that the tenant must give to the Council a reasonable opportunity of making a valuation of his goods, implements, &c. The Board are advised that this provision refers to such goods, implements, &c., as are proposed to be sold, and that it does not refer to any items in the claim as to which a valuation is not material. Such expenses, therefore, as the costs of removal and the expenses of a sale would be payable in spite of the fact that no opportunity was given for making a valuation.

ADAPTATION OF SMALL HOLDINGS.

I take this opportunity of sending, for the information of your Council, copies of instructions* as to the particulars which should accompany proposals for the adaptation of Small Holdings, which have been drawn up by the Board in consultation with the Local Government Board, and I am to ask that they may be communicated to the officers of your Council, who are responsible for work of the kind.

* Not printed.

Compliance with the instructions will save much unnecessary delay. Works of adaptation should not in any case be commenced until the Local Government Board have sanctioned the loan in respect of them.

I am, &c.,

T. H. ELLIOTT,

Secretary.

The Board have addressed the following Circular, dated 15th May, 1911, to County Councils and Councils of County Boroughs in England and Wales, with regard to the provision of small holdings :—

Small Holdings Act. Provision of Holdings for Unsatisfied Applicants.

SIR.—I am directed by the Board of Agriculture and Fisheries to inform you that they have had under consideration the information supplied by County Councils as to the number of applicants who have been provisionally approved as suitable for small holdings, but who have not yet been provided with land.

It appears that on the 31st December last 8,168 individuals and 7 associations whose applications for small holdings had been approved had not been supplied with land, and that the estimated quantity of land required for the purpose was 127,256 acres.

The Board are of opinion that the time has come when a special effort must be made to deal with this unsatisfied demand, and for this purpose it is necessary that they should be supplied with full information on the subject in order that they may be in a position to advise as to the steps which should be taken.

The inquiries which the Board have made in certain parts of the country indicate that a considerable number of the unsatisfied applicants have received and refused offers of suitable land which could have been obtained for them on reasonable terms, and that many others are not prepared to pay the rents which would have to be charged for the land they want. In the case of other applicants it has appeared on further investigation that they have insufficient capital to take a holding with any prospect of success. It is the case of the admittedly suitable applicants for whom holdings have not yet been provided which demands special attention at the present time, and the Board propose to increase their staff with a view to assist County Councils to deal promptly and systematically with these cases.

In order that the real extent of the work to be done may be ascertained, the Board would be obliged if you would fill up the enclosed form of Return* as to the applications received by your Council up to the end of 1910, and also supply a list of the names and addresses of all the unsatisfied approved applicants, stating the date on which they applied, the quantity of land desired, whether or not land has been offered to them by the Council, and adding any other observations which your Council may wish to make. It would be convenient if the list can be arranged according to the parishes and other divisions of the county in which the applicants reside. The Board will then instruct one of their officers to inquire into each application and to report as to the steps that should be taken to deal with it. If it is found that it is imprac-

* Not printed.

ticable to meet the requirements of any particular applicants, the Board will notify the Council accordingly, and suggest that their names should be struck off the list.

The Board feel sure that your Council will recognise the need of dealing without further delay with the outstanding applications, some of which were made over three years ago, and that they will be ready to give the Board their assistance and co-operation in the matter.

The Board will be glad to receive the information asked for not later than the end of this month.

I am, &c.,
T. H. ELLIOTT,
Secretary.

Returns as to the Produce of Crops in Great Britain.

The Agricultural Statistics (Part II.) for 1910 (Cd. 5604, price 5*d.*) contains the final returns of the produce of crops in Great Britain, with summaries for the United Kingdom. Summaries of these returns have previously appeared in the *Journal*, and were issued in the form of preliminary statements as the particulars became available. The tables in this publication are preceded by a Report by Mr. R. H. Rew, in which various features of the returns are discussed.

MISCELLANEOUS NOTES.

Importation Regulations.

Importation of Plants and Seeds into Chile.—The Chilian *Diario Oficial* for March 13th contains a Decree providing that plants, fruit and forest trees, shrubs, tubers, bulbs, roots, and vine cuttings shall be examined prior to clearance through the Customs, and, if found diseased, shall be disinfected or otherwise treated. The importation of vine plants with the roots attached is prohibited. Seeds of fruit or forest trees, of decorative and forage plants, and especially of leguminous plants, such as beans, lentils, carobs, lucerne, and clover, shall be subject to similar inspection. It is further provided that the importation of the foregoing articles shall in future only be permitted through the Customs houses of Valparaiso and Talcahuano. (*Board of Trade Journal,* May 4th, 1911.)

Importation of Plants into Algeria.—A Decree of April 21st last, published in the *Journal Officiel* of May 1st, prohibits the importation into Algeria of plants of a fibrous nature (other than vines and resinous plants), palms, rooted or otherwise, and the fruit of orange trees, except through the ports of Algiers, Oran, and Bône, and the postal station of Ghardimaou. The plants will be disinfected on arrival.

Importation of Horses, Cattle, Sheep, Goats, and Swine into France.—The existing French regulations regarding live stock from Great Britain require a certificate of the Board of Agriculture and Fisheries as to the freedom from disease of the district from which the animals proceed. Intending exporters should therefore send to the Board :—

1. A certificate, signed by a duly qualified Veterinary Surgeon, to the effect that the animal to be exported has been examined, and is apparently free from the following diseases :—

In the case of Horses.—Glanders, Farcy, and Dourine.

In the case of Cattle.—Foot-and-Mouth Disease and Pleuro-Pneumonia.

In the case of Sheep and Goats.—Foot-and-Mouth Disease, Sheep-pox, and Scab.

*In the case of Swine**.—Foot-and-Mouth Disease, Swine, Fever, and Swine Erysipelas.

The certificate should give the description and distinctive marks of the animal for purposes of identification, and state that the animal is apparently in good health. It need not be sworn before a Magistrate, and may be signed by any duly qualified Veterinary Surgeon.

2. The name and address of the exporter.

3. The proposed date of exportation.

4. The proposed port of shipment.

5. The name and address of the consignee in France. In the case of horses going to France for a short time only, the name of the place to which they are to be sent will be sufficient.

6. *A declaration that the animal has not been exposed to the diseases* quoted in paragraph 1, signed by the owner or person in whose charge it has been, (*a*) in the case of horses going to France temporarily—for the previous month, (*b*) in the case of other animals—for the previous six weeks. In the latter case it must also be stated where the animal has been during the previous six weeks. The declaration need not be sworn before a Magistrate.

The application, together with the above-mentioned information, should be sent to the Board not more than five days, and not less than one day, before the proposed date of embarkation. Applicants who call at the office should ask for the Intelligence Branch. If the information supplied is in order, the certificate of the Board can, as a rule, be issued on the same day.

Notes on Agriculture Abroad.

Milk Testing Associations in Canada.—There has been a rapid rise in recent years in Canada of Associations for testing and recording the milk yield of cows. According to the Canadian *Census and Statistics Monthly* for April, 1911, the Dairy and Cold Storage Branch of the Canadian Department of Agriculture made attempts in 1904 and 1905 to interest farmers in the work by testing cows in Quebec, Ontario, and Prince Edward Island. The first milk-testing association was formed in January, 1906, at Cowansville, Quebec, and by the end of the year 16 associations were at work with over 4,000 cows. This number had grown in 1910 to 167 societies with 11,850 cows tested, and the early months of 1911 saw a further extension of the work by the establishment of "Dairy Record Centres" in Ontario, Quebec, and Prince Edward Island, with an official in charge of each to supervise the regular association work and dispense dairying information.

In these associations members agree to weigh the milk of each cow in the herd night and morning on at least three days every month throughout the entire period of lactation, and to take samples of each of the six milkings. These composite samples are tested once a month at

* The regulations prohibit the importation of any swine weighing less than 50 kilograms (110 lb.).

the nearest cheese factory or creamery. Members provide themselves with scales, sampling dipper, and one sample bottle for each cow. The Dairy Branch of the Department of Agriculture has so far provided all blank record forms free, together with preservative tablets and sulphuric acid for testing. In addition to this the Department has paid the local makers at the factories for testing each sample every month.

Many members have taken the next step in systematic testing, and are now weighing each milking daily, and recording the weights and kinds of feed consumed. The Department also supplies a small booklet for keeping an account with each cow in the herd.

It is stated that compensation for the time and labour involved in testing and recording is probably soon obtained by the saving of time, labour, and food in the case of animals which are discovered to be not worth their keep. Good herds are built up by the retention of heifers from the best dams and the elimination of worthless animals. Cows are said to be selling for higher prices in consequence of the evidence of their value as milk producers, which is shown by their records.

Increase in the Productivity of the Sugar Beet in Germany.—The last forty years have witnessed a remarkable increase in the productivity of the sugar beet in Germany. As will be seen from the following figures, the amount of sugar eventually obtained per acre at the present time is more than double what it was in 1871:—

Period.	Yield of roots per acre.	Percentage of sugar extracted.	Net amount of sugar obtained per acre.
	Cwt.		Cwt.
1871–1876	196	8·58	16·8
1876–1881	222	8·78	19·6
1881–1886	248	10·37	25·7
1886–1891	238	12·27	29·2
1891–1896	235	12·32	28·9
1896–1901	241	13·31	31·9
1901–1906	236	14·42	33·9
1906–1911	239	15·55	37·1

The yield of roots per acre in 1910–11 was 261 cwt.

Much of this result is due to the improved technical processes now in use in the factories for the extraction of the sugar, but the achievement must also be ascribed in part to improvements in the varieties of sugar beet. Compared with the root of four decades ago, the sugar beet of to-day is more prolific, has a higher sugar content, is much more resistant to the attacks of disease (both of root and leaves), and to climatic changes, and is much more susceptible to the influence of good manuring. The farmer has also contributed much to the success in that he has learnt, partly from his own experience, and partly from the results obtained by scientists, the value of better methods of cultivation. (*Fuhling's Landw. Zeitung*, April 1st, 1911.)

Opening for Trees and Arboricultural Materials in Uruguay.—The Board have received through the Foreign Office a copy of a memorandum from H.M. Vice-Consul at Montevideo, in which it is stated that the newly-appointed Uruguayan Minister of Industries, Dr. Eduardo Acevedo, is anxious to foster the agricultural development of the country in the direction of tree planting. With this object he intends to organise a competition at which twenty prizes of the total value of about £40,000 will be given for plantations of woods and artificial parks. He has brought in a Bill which will probably be sanctioned.

making it binding on every proprietor of pastoral land to plant five trees for every hectare (equivalent to two trees for every acre). H.M. Vice-Consul is also informed that the Government School of Agronomy will be put in a position to supply trees for those who require them.

British horticultural firms who might wish to supply part of the demand thus created should put themselves in communication with Senor Pablo Varzi, Presidente del Consejo de Administracion y Patronato, Escuela de Agronomia, Montevideo.

Notes on the Weather in May.

The outstanding feature of the weather during May was the unusual warmth experienced over the whole country in the last three weeks. This high temperature was in no case accompanied by heavy rainfall, and in the western districts of England and Scotland the fall during the last two weeks was uniformly light. Notwithstanding the warm weather and lack of heavy rainfall, the amount of bright sunshine recorded varied greatly at different times and in different districts, and in many cases, owing to cloudy conditions, unusual temperature was accompanied by scanty sunshine.

During the *first* week (April 30th to May 6th) the earlier days of the week were more or less rainy over Great Britain generally, but although the conditions over England soon became finer and drier, occasional rain continued in most of the western and northern districts until the end of the week. In England N.E the rainfall was "light," in England S.E., E., Midland Counties, and in Scotland E. it was "moderate," and elsewhere it was "heavy" or "very heavy." Warmth was everywhere "moderate."

The weather in the *second* week, after being fair to bright very generally during the greater part of the week, became changeable and thundery, at first in the south, and finally in the north also. Some localities, however, experienced neither rain nor thunder. Warmth was "very unusual" except in Scotland N. and E., where it was "unusual"; the excess above the average temperature amounted in several districts to more than 5°, and in Scotland W. to more than 6°. Rainfall in the Midland Counties was "light," and elsewhere "moderate." Bright sunshine was just equal to the average in the Midland Counties and above it in other districts.

At the commencement of the *third* week the weather was rainy over the major portion of Great Britain, but was subsequently mostly dry, though seldom very bright. Taking the week as a whole, the rainfall was "moderate" in England E., N.E., and Scotland E., and "light" in other parts. Warmth, except in Scotland E. and N., was again "unusual." Bright sunshine, on the other hand, was "scanty" in England E., N.E., and Scotland E., and "very scanty" in England S.E. and the Midland Counties.

Generally fair or fine weather was experienced in the *fourth* week, but in nearly every part the conditions were at times unsettled. Thunderstorms, accompanied in many instances by extremely heavy falls of rain, occurred at a few places in the south of England on Thursday, and over a large portion of the country on Friday and Saturday. Temperature still continued "unusual" or "very unusual," and increased during the week. Rainfall was less than the average

in all districts, the fall being very slight in England E. Bright sunshine was more than the average in most districts, but only equal to it in England S.E.

Notes on Crop Prospects Abroad.

The International Institute of Agriculture, in its Bulletin of Agricultural Statistics for May, 1911, gives the following particulars with regard to the condition of winter-sown cereals on May 1st, 1911, compared with the condition on the corresponding date in 1910:—

Country.	Winter Wheat.		Winter Rye.		Winter Barley.		Winter Oats.	
	May 1st, 1911.	May 1st, 1910.	May 1st, 1911.	May 1st, 1910.	May 1st, 1911.	May 1st, 1910.	May 1st, 1911.	May 1st, 1910.
Belgium ...	105	—	105	—	105	—	—	—
Denmark ...	100·8	97	101·4	97	—	—	—	—
Luxemburg...	102	91	103	98	102	93	102	—
Roumania ...	120	105	120	105	120	103	—	—
Servia	100	—	100	—	100	—	100	—
Sweden ...	105	100	97	100	—	—	—	—
Switzerland	99	100	90	95	103	104	—	—
United States	100·1	94·7	100·3	102·1	—	—	—	—
Japan	95	103	—	—	95	101	—	—
Tunis	120	100	—	—	110	99	115	100

(100 = average of past ten years.)

The following supplementary information is also given:—

Belgium.—The period of cold, frost, and drought at the beginning of April, which somewhat retarded vegetation, was followed, at the end of the month, by beneficial rains. Serious damage from field mice is reported from several districts. On May 1st the condition of winter wheat, rye, and oats was good.

Italy.—During the first ten days of April cold weather retarded vegetation, without causing any serious damage, however, to the crops. Though there was a lack of moisture during the remainder of the month the condition of winter wheat, rye, barley, and oats was, in general, good, on May 1st.

Netherlands.—For several weeks past weather conditions have been very favourable to the development of winter cereals.

Roumania.—During the first half of April, the cold weather retarded the vegetation of cereal crops in various parts of the country. During the latter half of the month the weather turned warmer and was favourable to the development of the young plants. On May 1st the condition of wheat, rye, and barley was good.

Servia.—Weather conditions are at present favourable, and the condition of the four cereal crops—wheat, rye, barley, and oats—is good.

Sweden.—The weather during April and the beginning of May was very favourable to the winter wheat and winter rye crops, and has caused the damage which these crops had suffered from unfavourable weather during the winter almost entirely to disappear.

Japan.—The condition of wheat and barley is bad. The falling temperature is unfavourable to the crops.

Tunis.—The condition of winter wheat, barley, and oats is excellent.

The following table shows the area sown with spring cereals in various countries :—

Country.	Spring Wheat.		Spring Rye.		Spring Barley.		Spring Oats.	
	Area sown.	Compared with 1910.	Area sown.	Compared with 1910.	Area sown.	Compared with 1910.	Area sown.	Compared with 1910
	Acres.	Per cent.	Acres.	Per cent.	Acres.	Per cent.	Acres.	Per cent.
Belgium ...	4,940	100	—	100	12,350	100	617,500	100
Denmark ...	—	—	—	—	575,510	100	995,410	100
Ireland	—	102	—	100	—	99	—	100
Luxemburg ...	296	105	44	210	2,248	109	77,558	100·7
Switzerland ...	10,374	100	6,175	100	9,633	100	80,522	100

The condition of barley and oats in Denmark on May 1st, 1911, was 98·7 and 99·4 respectively; while the condition of wheat, rye, barley, and oats in Switzerland on that date was 100, 100, 103, and 101 respectively.

The condition of the spring cereals generally was good in Belgium, Italy, and the Netherlands, and the condition in various other countries was as follows :—

Roumania.—Spring sowing is now approaching completion. The work has been carried out under normal conditions, and the crops are coming up regularly except in the north, where field work has been delayed by cold. Development has been considerably aided by rain and warm weather since the end of April.

Russia.—Spring sowing is late in almost the whole of the black soil belt. In some districts in the south, preparatory work was commenced at the beginning of April, but a spell of cold weather caused an interruption, and work could only be resumed towards the middle of the month.

Servia.—Sowing of all the spring cereals is now finished except for maize, which, however, is also approaching completion. The seeds germinated under good conditions, and the young shoots are coming up regularly. The weather was stormy towards the end of April, but did not affect the development of the plants.

Canada.—The period of spring sowing is later than usual this year. The rainfall during the present month has, up to the present, been sufficient.

Russia.—H.M. Vice-Consul at Nicolaieff, in a dispatch dated May 31st, states that the condition of the winter and spring wheat and barley in the Governments of Kherson, Kharkov, Taurida, Poltava, and Kieff, at the date of the dispatch was, on the whole, good, but rye was not so good. Abundant rains fell in the last week of May. The season was a month late.

Reports in the official *Commercial Gazette* of May 1st to 14th, forwarded by H.M. Commercial Attaché at St. Petersburg, state that the prospects for both winter rye and wheat are medium, and some anxiety prevails in the chief grain-growing regions on account of drought. Wheat has suffered in general much more than rye from the snowless

winter and spring frosts, and more often than rye gives indications inclining to less than average yield. The sowing of spring grain was delayed somewhat in most regions, though accomplished under favourable conditions, but here also the influence of the drought is feared.

An extract from the *Torgovo-Promyshlennaya Gazeta* of May 7th, forwarded by H.M. Consul-General at Odessa (Mr. C. S. Smith), states that the winter crops have hibernated well, so that little resowing will be necessary. As a rule the weather has favoured the preparation of the fields for the spring crops, which, in the southern parts, begin to show well. In most cases the need of rain is becoming urgent. Showers appear to have been only local.

Germany.—The report of the Imperial Statistical Bureau gives the conditions of the crops at the beginning of June as follows:—Winter wheat, 2·5; spring wheat, 2·6; winter spelt, 2·5; winter rye, 2·7; spring rye, 2·5; barley, 2·4; oats, 2·6; potatoes 2·6; (2=good, 3=average). The condition of autumn-sown cereals, although on the whole fairly good, varied greatly in different parts of the country, the plants being well forward in some districts, but leaving much to be desired in other districts.

Austria.—The Austrian Ministry of Agriculture estimates the condition of the crops in the middle of May as follows:—Wheat, 2·5; rye, 3·1; barley, 2·3; oats, 2·4; maize, 2·1; and potatoes, 2·2; the condition of each crop, except potatoes, being less favourable than at the corresponding date in 1910 (2=above average, 3=average, 4=below average). Wheat had improved since the previous month's report, but rye had suffered more than wheat from the drought. The development of barley and oats is fairly good.

Fruit Crop in Austria.—The fruit crop has been very favourably influenced by the fine weather which followed the April frosts. In the southern districts the blossoming was completed by the end of April, but in the northern districts this was only the case with stone fruit. Damage is reported only in districts where the crop is of little importance. (*Statistische Nachrichten,* May 9th, 1911.)

Roumania.—A dispatch from H.M. Consul at Bucharest (Mr. Errol MacDonell), dated May 10th, states that spring sowings were delayed by adverse weather during the first half of April, and in many parts barley and oats were only sown late in the month. At the date of the dispatch, however, the spring sowings of early April were already showing above ground. Autumn-sown rye and oats were generally good, though they did not grow much until the latter half of April. Autumn sowings in Mehedintz and Gorj and in the higher lands were not so good, and in the most northern districts the crops were affected by the heavy fall of late snow.

Canada.—According to the report of the Canadian Census and Statistics Office the condition of winter wheat in the Dominion at the end of April was 82 per cent. of the normal (81 per cent. in Ontario and 89 per cent. in Alberta). The area reported to be killed during the winter is 21 per cent. The seeding and growing season for the whole of Canada opened late this year, and the month of April was marked by hard frosts. May has been favourable to the cultivation of the land, however, and the rainfall has been sufficient for healthy vegetation. Spring sowings were well advanced in Manitoba, Saskatchewan,

Alberta, and British Columbia, but were backward in the Maritime Provinces. (*Census and Statistics Monthly*, May, 1911.)

Maize Crop of South Africa.—The following estimate of the maize crop this year has been received from the South African Trades Commissioner in London:—

—	Actual Yield, 1910.	Estimated Yield, 1911.
	Quarters.	Quarters.
Transvaal Province	1,354,166	1,041,666
Orange Free State Province	641,666	312,500
Natal Province	624,999	520,833
	2,620,831	1,874,999

The falling off in the yield is due to the severe drought in these Provinces this season. The maize crop in the Cape Province has been normal, but the quantity produced there is as a rule consumed locally, and will, therefore, not affect the export trade. There is thus likely to be little, if any, maize available for export this year from the Union. (*Board of Trade Journal*, June 1st, 1911.)

Spain.—H.M. Consul at Seville (Mr. Arthur Keyser), in a dispatch dated May 26th, states that the corn crop is expected to yield a heavy harvest, the appearance of most of the fields of growing corn being unusually fine. Recent rains have caused pasture to be plentiful, and the sale of stock at all country fairs, now taking place weekly, is far beyond the average. A time of general prosperity is anticipated.

United States.—The Crop Reporting Board of the Department of Agriculture estimates the condition of winter wheat on June 1st as 80·4, compared with 80·0 on June 1st, 1910, 80·7 on June 1st, 1909, and 81·6, the average of the past ten years. Preliminary returns of spring wheat make the area sown 20,757,000 acres, or an increase of 4·9 per cent. over last year's area. The average condition of spring wheat on June 1st was 94·6, compared with 92·8 on June 1st, 1910, 95·2 on the same date of 1909, and a ten year average of 93·6. The area under oats shows a decrease of 0·1 per cent., compared with the acreage in 1910, the condition on June 1st being 85·7, against 91·0 on June 1st, 1910. The acreage under barley is about 3 per cent. smaller than that of last year; the condition on June 1st was 90·2, against 89·6 last year. (*Dornbusch*, June 8th, 1911.)

Argentina.—A dispatch dated May 4th, from H.M. Chargé d'Affaires at Buenos Aires, states that the drought which prevailed during March was broken early in April by very heavy storms, these extending to the region round Bahia Blanca, which had suffered most severely from the drought. The rain has come too late in the year, however, to benefit pasture land. The mortality in live stock owing to the drought is likely to be felt for some time to come. The soil has been softened sufficiently to allow ploughing, but, for want of grass, horses will be too weak to plough the full extent, and a reduced harvest among the smaller cultivators will be the result. Agricultural prospects generally, however, have risen considerably since the rain.

Crop Conditions on June 1st.

The Crop Reporters of the Board, in reporting on agricultural conditions on the 1st June, generally state that the crops have done well during May; the first portion of the month was everywhere very beneficial, but the dry weather was lasting too long, and rain is now anxiously looked for. Wheat has made good progress, and has generally improved, being a strong and healthy plant; still, however, with the same exceptions of patches sown late in the autumn. Barley and oats are also both doing well, but now stand in need of rain, especially the oats, which are perhaps the less satisfactory of the two. Some fields of barley are looking yellow owing to the dry weather. The total area under barley would seem to be slightly less than last year, that under oats being slightly greater; so that the total acreage under cereals in Great Britain would seem to be somewhat larger than in 1910. Beans and peas are generally doing well, though the former are mostly short in the haulm.

Potatoes are generally coming up well; here and there some early pieces have been damaged by frost. The area under this crop is estimated to be a few thousand acres above that of last year.

Mangolds are generally fairly satisfactory, although, like everything else, they stand in need of rain. Turnip-sowing, in many districts in the south, had hardly commenced, the land being too dry, and this operation was generally backward. In the north, on the other hand, and particularly in Scotland, turnip-sowing was much more advanced than usual. Where the plants were up, they had been very generally attacked by the fly, and, failing rain (which is, of course, everywhere required), much re-sowing will be necessary.

"Seeds" hay promises rather better than meadow hay, although reports from different districts vary considerably. In Norfolk, Lincoln, the East Riding, and parts of the South-West of England and in Wales, few crops are reported to be above average, but elsewhere, and especially in Scotland, abundant crops prevail. Representing an average crop in Great Britain by 100, the yield of "seeds" hay in 1911 will probably be represented by a percentage of 102, that of hay from permanent grass by 101; but while many districts will give a much higher yield, many others will have poorer results.

Large crops of strawberries and currants, good crops of raspberries, and a fair (though very variable) yield of gooseberries, are indicated from nearly all districts, the principal exceptions coming from Worcester. Apples and cherries generally promise to be abundant, though the latter are under average in Kent; plums should also be a large crop (with the important exception of the Worcester district), and pears above average. Generally there is much blight on the fruit trees, and washing is being done on a considerable scale.

The area under hops is probably four or five per cent. less than in 1910, though the Kent acreage will probably be nearly maintained. The plant is growing well, and has made rapid growth, looking strong. It has already been very generally attacked by vermin, and washing is general.

Pastures, until towards the end of the month, were very full of grass, but the drought is beginning to tell upon them, and they are mostly beginning to get bare, although several reports still state that

there was more upon them than usual at the date of these reports. Live stock have thriven well during the month.

The Board of Agriculture and Fisheries have been furnished by the Board of Trade with the following report, based on returns from correspondents in various districts, on the demand for agricultural labour in May:—

Agricultural Labour in England during May.

The dry weather which prevailed during the greater part of May enabled farm work to proceed with little or no interruption. In a few cases the weather, by checking the growth of weeds, lessened the demand for extra labourers for hoeing and weeding, but generally such work, and sowing potatoes and roots, carting manure, &c., provided a good deal of employment for extra men, and the supply of labourers was about equalled by the demand. Men for permanent situations, particularly for work like milking, where Sunday labour is required, were reported as scarce in several districts.

Northern Counties.—Employment in these counties was generally regular throughout the month. The supply of extra labourers was about equal to the demand, which was fairly good, on account of such work as sowing root crops, carting manure, and hoeing corn. No change in wages was reported at the May hirings for single male farm servants in *Northumberland*. Men for permanent situations were in good demand in several districts in the West Riding of *Yorkshire*.

Midland Counties.—Hoeing and weeding, carting manure, planting potatoes and roots, and threshing provided a good deal of employment for extra labourers, and the supply of and demand for these men were as a rule about equal, though in a few districts employment was a little slack towards the end of the month, on account of the prolonged dry weather. A scarcity of men for permanent situations was reported in several districts in *Worcestershire* and *Oxfordshire*.

Eastern Counties.—There was a good demand for extra labourers in these counties, principally for hoeing and weeding, and, while the supply of men was generally sufficient, there was some scarcity in several districts, including the Spilsby (*Lincolnshire*), East and West Flegg, and Swaffham (*Norfolk*) Rural Districts. Little or no change was reported in men's wages at the May hiring fairs in *Lincolnshire*.

Southern and South-Western Counties.—Extra labourers were in fairly good demand on the whole in these counties, though several correspondents mentioned that the demand was lessened by the dry weather, less hoeing than usual being required; the supply of men was generally about equal to the demand. A scarcity of permanent men, especially milkers, was reported in several districts in *Sussex*, and in the Godstone (*Surrey*), Chippenham (*Wiltshire*), Hereford, and Stow-on-the-Wold (*Gloucestershire*) Rural Districts.

THE CORN MARKETS IN MAY.

C. KAINS-JACKSON.

Business in grain was active during almost three weeks of May, but the continued fine weather exerted its influence before the end of the month, which closed with market tendencies favouring the buyer.

Wheat.—Owing to the exhaustion of stocks of home-grown grain, natural at this season, the prices obtainable at the country markets have shown some improvement, generally about a shilling on the month, and in some cases two shillings. The best East Kent white fluffs made later in May 37*s.* per 504 lb., 35*s.* was paid for sound Norfolk red, and 33*s.* 6*d.* made for Essex rivetts. Even poultry wheat was held for 32*s.* per 480 lb., 30*s.* being also paid for light, or 448 lb. lots.

Australian wheat has shown remarkable intrinsic strength in view of the 1,500,000 qr. which are now on passage. This is a large quantity, and its mean quality is not extremely high. The price is about 37*s.* Canadian wheat, on the other hand, has been the subject of a "slump," and against 38*s.* 6*d.* on the last day of April, 37*s.* 3*d.* was accepted on May 31st. This relates to top grade, the decline on other sorts being proportionate. At Liverpool on the 31st a cargo of the best Manitoba was offered at 34*s.* 3*d.* for prompt shipment, a price which, after making allowance for landing charges and market profit, argues a further 1*s.* spot decline, or 36*s.* 3*d.* against 37*s.* 3*d.* The depreciation of the very valuable Canadian product appears to be due to the large area sown for the 1911 crop, the good promise shown by that area at the end of May, and the consequent readiness of Canadian farmers and owners of wheat in elevator to sell out their 1910 wheat previously held very firmly. Russian wheat is not cheaper on the month, 32*s.* to 36*s.* being the ordinary range. Indian wheat tended to decline a little, but, the shipments being moderate, there was no pressure to sell.

The shipments of the month were 677,000 qr. from North America, 1,395,000 qr. from South America, 2,712,000 qr. from Russia, 424,000 qr. from Europe S.E., 365,000 qr. from India, and 549,000 qr. from Australasia. The Russian shipments were extremely heavy, but only 300,000 qr. are on passage to the United Kingdom, and the Continental inquiry has been much above the average. The French and Italian crops promise a better yield this season, but it will not be before the beginning of August that new crop deliveries will be large enough to meet current market wants. Meanwhile Russia is playing the chief part in making up the deficiency.

The total shipments of breadstuffs for ten months of the shipping year, August 1st to May 31st, were 61,460,000 qr., against 52,100,000 qr. last season, but estimated imports of breadstuffs into the United Kingdom for the same period were about 750,000 qr. less than previously. The increase in the Continental demand therefore is seen to have been about 10,110,000 qr. The quantity of wheat on passage at the end of the month was 3,510,000 qr., or decidedly less than at the like date last year. It includes a relative excess of white sorts, so that spot holders of red are in a stronger position than holders of the former.

The progress made by the young wheat during May was regarded, on market advices, as very good, not only in Great Britain, but also in France, the United States, and Russia.

Flour.—The top-price has been stationary at 31*s.* all through the month, nor have either Household or Country sorts undergone any material fluctuations. Hungarian is 2*s.* dearer, but this rise is common in *May* or *June*, the old crop flour getting used up, and value appreciating pending new crop flour being put on sale in the early autumn. American offers for June and July shipment came on the 31st at rates which were depressing to the spot market. There were, however, only 190,000 sacks of foreign flour on passage, and stocks in hand are moderate.

Barley.—Supplies of British have become very small, and the averages are consequently regarded as more or less deceptive. The reduced supply of foreign on passage at the end of April appeared likely to cause prices to advance in May. This probability was realised, and the cheapest, Russian, closed fully 1*s.* dearer on the month. The supply on passage has not been augmented, and closed at 315,000 qr., including malting as well as feeding. The shipments were 90,000 qr. of brewing from California, 2,357,000 qr. of feeding from Russia, and 140,000 qr., mostly feeding, but some brewing, from Europe S.E. and Anatolia. The large Russian shipments were nearly all taken by different Continental ports.

Oats.—British averages show a general improvement on the month, and the price of imported oats has been well maintained, despite the weather being against a large use of this feeding stuff. The rival shippers—Russia and Argentina—sent off respectively 917,000 qr. and 354,000 qr. Argentina fell considerably below expectation in her exports. The supply on passage on 31st was 575,000 qr., as compared with 310,000 qr. a year ago. Stocks of oats in British granaries are reduced, however, so that the extra 265,000 qr. are not expected to cause depression on arrival.

Maize.—Unusually good shipments of round (353,000 qr. from Russia and 691,000 qr. from Europe S.E.) have continued to be reported, but America only sent off 260,000 qr. of flat and mixed corn, and Argentina had no yellow to ship. South Africa appears unable to accept the British orders for supply; the South African maize is appreciated in this country, but there is seldom much freedom in offerings, and during May inability to promise supplies has been repeatedly cabled in reply to inquiries. Burma is stepping in to some extent with offers to ship at five guineas per ton c.f.i. to London. This is 22*s.* 6*d.* per 480 lb., the ordinary selling unit in England. America has greatly surprised the trade by the smallness of her shipments. May imports of maize were the smallest monthly total since April, 1908, and the position of holders has gained in strength during the month. The supply on passage on 31st, 420,000 qr., was very moderate.

Oilseeds.—The quantity of linseed on passage has increased during the month from 172,000 to 244,000 qr., while that of cottonseed has fallen from 30,000 to 21,000 tons. The increase in the prospective supply of linseed is satisfactory to the extent that it goes, but how small that extent really is may be gathered from the returns of exports from all countries since January 1st. For the first five months of the year the

figures are:—1911, 2,360,000 qr.; 1910, 3,115,000 qr.; 1909, 4,070,000 qr. While this percentage of difference prevails it is manifestly unreasonable to look for anything like cheap linseed, nor while the chief oilseed is dear is there much chance of other kinds being other than dear also. At the present moment the best bargains, based on the analyst's tables of oil and other contents in proportion to the price, are *sunflowerseed and sunflowerseed cake;* 14*s.* per cwt. is being asked for the seed. Sunflowerseed cake is not much known in England, but is largely used in Russia. The British farmer with stock to fatten might apparently do well to study the possibilities of this cake. Linseed at the close of May was quoted at 17*s.* to 18*s.* per cwt., Egyptian cottonseed at 8*s.* 3*d.* to 8*s.* 6*d.* per cwt.

Various.—Of the staples usually referred to under this heading soy beans are rather cheaper on the month, beet-sugar, rice, and canary-seed unchanged. Indian chick peas at 5*s.* per cental are excellent feeding value. Many prefer to buy them in the split form at 8*s.* 6*d.* per 160 lb. bag.

THE LIVE AND DEAD MEAT TRADE IN MAY.

A. T. MATTHEWS.

Fat Cattle.—It was fully expected that, as the end of the stall-feeding season approached, there would be a considerable advance in the value of British beef, but these hopes have thus far been disappointed. There has indeed been a small improvement, but only to the extent of 1*d.* to 1½*d.* per stone of 14 lb., while it would require as much as that per lb. to meet the views of feeders, and to justify the present cost of stores. The following list of average prices in the English markets shows at a glance the extent of the upward movement that has taken place as compared with April values:—Shorthorns, for the three qualities as classified in the official returns:—8*s.* 4½*d.*, 7*s.* 8¼*d.*, and 6*s.* 8*d.* per stone, against 8*s.* 3¼*d.*, 7*s.* 7*d.*, and 6*s.* 6½*d.*; Herefords, first quality, 8*s.* 6½*d.*, second, 7*s.* 11*d.*, against 8*s.* 6*d.* and 7*s.* 11*d.*; Devons, 8*s.* 7*d.* and 7*s.* 9½*d.*, against 8*s.* 5½*d.* and 7*s.* 8½*d.*; and Scots, 8*s.* 6*d.* and 7*s.* 11½*d.*, against 8*s.* 4½*d.* and 8*s.*

One noteworthy feature of the month's trading was the higher prices prevailing in several of the southern markets compared with those of the north. In the week ending the 18th, 8*s.* 9*d.* per stone was made for prime Shorthorns at Basingstoke, Dorchester, and Newport, while at Shrewsbury the top price was 7*s.* 7*d.*, and at Leeds and Liverpool, 8*s.* 2*d.* London also, in that week, only quoted 8*s.* 2*d.* Islington prices have been well above the average during the spring months prior to May, but are now considerably below it. Scottish markets have been less strong than the English, for cattle, for the last few weeks.

Veal Calves.—There has been a fair demand for first quality fat calves, but more of the second class have been on offer as usual at this season, and the average price of both in about twenty British markets declined ½*d.* per lb., as against that of April. Prices were fairly even, and the average was 9*d.* and 8*d.* per lb.

Fat Sheep.—Sheep sold in the wool during May were comparatively very few, and may be ignored in the quotations of prices. The following averages are therefore confined to clipped sheep:—Downs, in about twenty English markets, averaged 7¼*d.* per lb., and a fraction over for first quality; 6¾*d.* for second, and 5½*d.* for third quality. This was fully ¼*d.* per lb. more than the April average. Prime small Longwools averaged 6¾*d.*, 6*d.*, and 5*d.*, also showing a farthing advance on first and third quality. In the last week there were very variable prices quoted in different markets. The best Downs fetched 8½*d.* per lb. at Derby, and 8¼*d.* at Islington, while at Leeds and York they were quoted at 6¾*d.* At Hull, Longwoolled ewes (clipped) were sold at the very low figure of 3¾*d.* per lb. In the same week Cheviots, also clipped, made 8¾*d.* per lb. at Preston, Liverpool, and Salford. At the end of the month there was a rather sharp advance in lightweight sheep, first quality advancing fully ½*d.* per lb. at London, but this did not extend to heavier sheep, which were difficult of sale.

Fat Lambs.—The trade in fat lambs forms a very important section of the business in live stock at this season, and official quotations were given in May for nearly forty British markets. The decline in the average price of 1*d.* per lb. in May means little, as naturally the size of the lambs has greatly increased. The general British average was 11½*d.* and 10*d.* per lb., against 12½*d.* and 11*d.* in April. The London trade showed a slight relative improvement, but still remained about ½*d.* per lb. below the general average price. Newcastle and Preston were quoted up to 1*s.* per lb. at the last May markets, while the highest London price was 10½*d.*

Fat Pigs.—The value of fat pigs gradually and steadily declined all the month, and the average prices were only 6*s.* 11*d.* and 6*s.* 3½*d.* per stone, against 7*s.* 3¼*d.* and 6*s.* 7½*d.* in April. As in August last the average for prime bacon pigs once touched 8*s.* 3*d.*, it can scarcely be said that the fall is due to the time of year and warm weather.

Carcass Beef—British.—In the London Central Market Scotch beef was fairly supplied, and trade was firm, except in the third week, when prices declined ¼*d.* per lb. The average value of both Scotch and English beef differed very slightly from that of April. It was 6⅛*d.* to 6¾*d.* for Scotch whole sides, and 5¾*d.* to 6⅛*d.* for English. The latter beef was very poorly supplied.

Port-Killed Beef.—There were rather larger supplies, and average prices for Deptford-killed beef were a shade better than in April, and at 5⅝*d.* to 6*d.* per lb. very nearly equalled those of English.

Chilled Beef.—States beef was rather more in evidence than in April, and best hindquarters fetched an average of about 6¼*d.* per lb., and best fores from 3¾*d* to 4¼*d.* Argentine chilled was very abundant, and, as usual, the trade in it was fluctuating and uncertain. On some days vendors quoted very variably, and fair averages were difficult to obtain. As near as can be calculated, best hindquarters averaged during the month 4½*d.*, and best fores 3*d.* per lb. The changes in the weather greatly influenced the trade in this article.

Frozen Beef.—A very quiet trade was passing in "hard" beef, and at times transactions were little more than nominal. Best hindquarters averaged about 3¾*d.*, and forequarters 2¾*d.* per lb.

Carcass Mutton—Fresh-Killed.—There were very good supplies of

Scotch mutton, but the very small sizes that fetch fancy prices became very scarce, and hardly quotable. Those on offer sold at 8*d*. to 8½*d*. per lb. The ordinary run of best Scotch were 48 lb. carcasses, and these varied from 7*d*. to 7½*d*. per lb. An offer of 10*d*. per lb. was made for 1,000 of these carcasses for export to the Continent, but was refused. English tegs made from 6*d*. to 6¾*d*. per lb.

Frozen Mutton.—This trade was much depressed, especially for heavy sheep, and April prices of 3*d*. to 3¼*d*. per lb. were not exceeded till the last week, when an advance of ¼*d*. per lb. was established.

Carcass Lamb.—British lamb sold at moderate prices all the month, the average price being 10*d*. and 9*d*. per lb. for first and second quality, but large quantities were sold at little more than mutton prices. Frozen lamb was also very cheap. The finest Canterbury did not exceed 4¾*d*. till the last week, when it advanced to 5*d*. per lb.

Veal.—There was little change in the value of English and Dutch veal from that of April; the best fetched 8½*d*. per lb. at Smithfield, with lower qualities ranging down to 5*d*.

Pork.—There is always a limited summer demand for pork in London, but supplies were too heavy in May, and in the third week 6*d*. per lb. was the top price, but smaller consignments in the last week caused the value to advance ½*d*. per lb.

THE PROVISION TRADE IN MAY.

HEDLEY STEVENS.

Bacon.—During the month of May, especially during the latter half, there was a much improved demand for all classes of bacon and hams. Prices early in the month were lower, and there was some accumulation of stock, brought about by the much larger arrivals, especially from the United States of America, Canada, and Russia, but towards the close of the month prices had hardened considerably.

About the middle of May the best Russian sides were selling at about 44*s*. per cwt., and best Canadian at 49*s*. to 56*s*. per cwt. These comparatively low prices materially improved the volume of trade, but the conditions did not last long, and by the end of the month some brands of both descriptions had advanced 6*s*. to 7*s*. per cwt. The warmer weather was doubtless the chief factor in bringing about the higher prices, having improved the consumption of all cured meats, especially hams. Some American hams showed advances on the month of from 6*s*. to 7*s*. per cwt. For the lighter weights, which continue scarce, still higher prices must be expected, although this greatly depends on the weather conditions.

The shipments of bacon and hams from the United States and Canada for the month of May show about 55 per cent. increase over last year, and this increase is likely to be maintained. Hogs continue to be marketed in America in larger quantities, but with the reported improved home consumption of bacon and hams, prices are on the whole higher, both for the raw and manufactured article. Prices for hogs at Chicago during May ranged from $5.35 to $6.40, against $9.20 to $9.80 in May, 1910, and $6.75 to $7.45 two years ago.

English pigs were marketed more freely, and prices are now easier all round, although porkers were scarce.

Cheese.—The expectation that prices for old cheese during May would be considerably higher was not realised; in fact, the reverse happened, all descriptions of imported cheese being cheaper on the month. Country buyers were very stubborn, and refused to operate except from hand to mouth; in order to force business, therefore, some holders steadily reduced their prices on both Canadian and New Zealand makes. The paucity of the demand for both of these descriptions is attributed by some to the fact that retailers did not reduce their prices in line with wholesale values, while others say it is on account of the quantity of really fine ripe States cheese on offer, and which have gone into consumption at the lower prices at which they were quoted.

The demand for fodder cheese this season has been smaller than for some years past, and really best Canadians of this description were selling towards the end of the month at about 51*s.* to 52*s.* c.i.f. The May make in Canada was less than last year on account of the backward season, but a very large make is expected during the month of June, on account of the good condition of the cows and the excellent prospects of the pastures.

A fair quantity of the May make of Northern States cheese was offered by cable at prices in line with Canadians. Until recently these goods have been required for home consumption at prices considerably above those current in Canada.

At the end of the month the estimated stock of Canadian cheese at the three principal distributing centres (London, Liverpool, and Bristol) were 65,000, against 99,000 at the same time last year, and 63,000 two years ago. The stock of New Zealand cheese was 26,000 crates in London and Bristol, against 32,000 last year.

Stocks of last season's English cheese are now in very small compass, smaller than for two seasons back. It is difficult to obtain reliable information, but probably the May make has been under the average, there having been a large demand for milk.

Butter.—The demand for butter was again disappointing, and it is reported that large quantitiese of Australian were put into cold store during the month. The arrivals from New Zealand were small, and for the most part found ready buyers on arrival. On the month prices show a drop of from 2*s.* to 5*s.* Most of the business was again in best selections.

The arrivals from Australia will continue large for the whole of next month, and probably throughout the summer. Siberian arrived in increased quantities, and the quality was very satisfactory. A large make of Irish butter is in progress, and tinning operations were in full swing at the end of the month.

Eggs.—The demand for fresh-laid eggs was good, and a fair quantity was stored for future use. Arrivals from Russia for the month were large, and prices favoured buyers, the warmer weather decreasing the consumption of this class of goods.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of May, 1911.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	England.		Scotland.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK:—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle:—	s. d.	s. d.	s. d.	s. d.
Polled Scots	8 6	8 0	39 11	37 0
Herefords	8 6	7 9	—	—
Shorthorns	8 4	7 8	38 9	36 4
Devons	8 7	7 10	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	9	8	8¾	7¼
Sheep:—				
Downs	7½	6¾	—	—
Longwools	7	6¼	—	—
Cheviots	8¾	8	8½	7½
Blackfaced	8½	7¾	7¾	7
Cross-breds	7¾	6¾	8½	7¼
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs:—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	6 11	6 5	7 1	6 0
Porkers	7 5	6 11	7 5	6 6
LEAN STOCK:—	per head.	per head.	per head.	per head.
Milking Cows:—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	22 2	18 13	22 0	18 2
,, —Calvers... ...	20 19	18 13	19 12	17 3
Other Breeds—In Milk ...	19 9	16 4	19 1	16 5
,, —Calvers ...	14 15	13 7	19 4	16 11
Calves for Rearing	2 8	1 16	2 18	2 2
Store Cattle:—				
Shorthorns—Yearlings ...	10 19	9 8	11 11	9 13
,, —Two-year-olds...	15 6	13 7	15 18	13 15
,, —Three-year-olds	18 16	17 2	17 18	15 14
Polled Scots—Two-year-olds	—	—	17 12	15 5
Herefords— ,,	16 12	14 18	—	—
Devons— ,,	15 4	13 9	—	—
Store Sheep:—				
Hoggs, Hoggets, Tegs, and Lambs—	s. d.	s. d.	s. d.	s. d.
Downs or Longwools ...	44 3	37 0	—	—
Scotch Cross-breds ...	—	—	37 2	32 11
Store Pigs:—				
8 to 10 weeks old	22 0	17 11	24 10	20 1
12 to 16 weeks old	31 9	25 2	36 0	27 9

* Estimated carcass weight.
† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of May, 1911.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	Birmingham.	Liverpool.	London.	Manchester.	Edinburgh.	Glasgow.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF:—							
English	1st	55 6	56 6	56 6	56 6	55 6*	56 6*
	2nd	52 0	52 0	54 6	53 6	51 0*	54 0*
Cow and Bull ...	1st	49 6	48 6	46 6	49 0	48 6	48 6
	2nd	43 0	41 0	42 0	45 0	39 6	42 6
U.S.A. and Canadian:—							
Port Killed ...	1st	55 0	56 6	55 0	56 0	—	55 0
	2nd	51 6	52 0	52 6	53 6	—	52 6
Argentine Frozen—							
Hind Quarters...	1st	36 0	36 0	36 0	36 0	36 0	36 0
Fore ,, ...	1st	27 0	27 0	25 6	27 0	26 6	27 0
Argentine Chilled—							
Hind Quarters..	1st	43 0	39 6	42 6	40 0	42 0	42 6
Fore ,, ...	1st	29 0	28 0	26 6	28 0	28 0	28 0
Australian Frozen—							
Hind Quarters...	1st	35 6	34 6	36 0	34 6	—	33 0
Fore ,, ...	1st	27 0	24 6	25 6	24 6	—	25 0
VEAL:—							
British	1st	71 6	75 0	76 6	74 0	—	—
	2nd	57 0	70 0	65 6	69 0	—	—
Foreign	1st	—	—	76 6	—	74 6	—
MUTTON:—							
Scotch	1st	—	76 0	72 6	77 6	63 6	70 6
	2nd	—	70 6	64 6	72 6	52 6	61 0
English	1st	62 6	67 6	61 0	70 0	—	—
	2nd	55 0	57 6	56 6	63 0	—	—
Argentine Frozen ...	1st	29 6	28 6	28 6	28 0	27 0	28 0
Australian ,, ...	1st	28 6	25 0	26 6	25 0	—	26 0
New Zealand ,, ...	1st	—	25 6	31 0	25 6	—	28 6
LAMB:—							
British	1st	—	95 6	93 6	97 0	93 6	107 6
	2nd	88 6	86 6	85 0	87 6	81 6	93 6
New Zealand ...	1st	48 6	44 6	45 0	44 6	49 6	48 6
Australian	1st	38 0	35 0	36 6	35 6	35 0	36 0
Argentine	1st	38 0	36 0	36 6	36 0	—	35 6
PORK:—							
British	1st	66 6	65 6	60 6	65 6	56 6	59 6
	2nd	59 6	57 0	56 0	60 6	51 6	55 6
Foreign	1st	—	—	57 6	—	—	—

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1909, 1910 and 1911.

Weeks ended (*in* 1911).	Wheat.			Barley.			Oats.		
	1909.	1910.	1911.	1909.	1910.	1911.	1909.	1910.	1911.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Jan. 7 ...	32 9	33 6	30 5	26 11	24 11	23 11	17 5	17 2	17 0
" 14 ...	32 8	33 8	30 8	27 1	24 11	23 10	17 5	17 7	17 2
" 21 ...	33 2	33 9	30 11	27 3	24 11	24 4	17 8	17 6	17 4
" 28 ...	33 0	33 6	30 11	27 6	25 0	24 5	17 9	17 4	17 3
Feb. 4 ...	33 4	33 7	30 9	27 7	24 10	24 5	17 10	17 7	17 5
" 11 ...	33 8	33 4	30 5	27 8	24 9	24 6	17 11	17 11	17 5
" 18 ...	34 1	33 0	30 3	27 11	24 6	24 7	18 0	18 0	17 6
" 25 ...	34 5	32 7	30 2	28 0	24 2	24 9	18 0	17 10	17 7
Mar. 4 ...	34 10	32 7	30 0	27 11	24 6	25 0	18 2	18 1	17 5
" 11 ...	35 8	32 6	30 1	28 4	24 1	25 0	18 2	18 0	17 5
" 18 ...	35 9	32 6	30 1	28 0	23 6	24 11	18 5	18 0	17 6
" 25 ...	36 0	32 9	30 2	28 0	23 7	25 0	18 6	17 11	17 5
Apl. 1 ...	36 5	33 0	30 3	27 10	23 8	24 11	18 8	18 0	17 5
" 8 ...	37 4	33 6	30 4	28 0	23 1	24 7	18 10	17 11	17 7
" 15 ...	38 7	33 7	30 3	27 8	23 5	25 2	19 2	18 3	18 3
" 22 ...	41 4	33 7	30 4	28 2	23 0	25 5	19 9	18 3	17 10
" 29 ...	42 5	33 0	30 11	27 10	22 10	25 5	20 0	18 3	18 3
May 6 ...	40 9	32 6	31 4	27 7	22 7	25 7	20 3	18 2	18 6
" 13 ...	41 6	32 1	31 8	27 3	22 0	25 1	20 6	18 1	19 0
" 20 ...	42 8	31 10	32 6	27 0	21 8	25 4	20 11	17 8	19 2
" 27 ...	42 6	31 3	32 8	26 3	21 4	25 0	21 0	17 10	19 5
June 3 ...	43 1	30 2	32 5	25 7	21 8	24 10	21 3	17 10	19 5
" 10 ...	42 11	29 1	32 4	26 10	20 9	25 7	21 4	17 10	19 7
" 17 ...	42 7	29 0		26 10	18 11		21 6	18 0	
" 24 ...	42 8	29 4		27 2	20 1		21 7	17 9	
July 1 ...	42 9	29 9		27 2	19 11		21 9	17 7	
" 8 ...	43 0	30 4		26 4	19 5		21 8	17 4	
" 15 ...	43 3	31 1		26 10	21 3		21 9	17 7	
" 22 ...	44 0	31 11		27 4	19 9		22 5	17 5	
" 29 ...	43 5	33 5		24 6	20 10		22 2	18 1	
Aug. 5 ...	44 9	33 9		27 4	20 5		22 11	18 3	
" 12 ...	44 9	33 5		24 9	20 4		21 8	18 0	
" 19 ...	41 6	32 11		23 11	20 11		19 8	17 11	
" 26 ...	38 5	32 7		24 7	20 10		19 4	17 2	
Sept. 2 ...	37 2	32 2		26 3	22 10		19 6	17 2	
" 9 ...	34 11	31 11		26 1	23 3		18 5	17 2	
" 16 ...	33 6	30 11		26 5	24 3		17 9	16 6	
" 23 ...	32 9	30 2		26 8	24 2		17 7	16 3	
" 30 ...	32 2	30 1		26 9	24 4		17 2	16 4	
Oct. 7 ...	31 8	30 1		26 9	24 7		17 0	16 3	
" 14 ...	31 4	30 2		27 0	25 1		17 0	16 2	
" 21 ...	31 8	30 4		27 7	25 3		16 11	16 1	
" 28 ...	31 10	30 4		27 9	25 4		17 0	16 2	
Nov. 4 ...	32 5	30 4		27 9	25 6		17 0	16 2	
" 11 ...	32 5	29 11		27 7	25 4		17 1	15 11	
" 18 ...	32 7	29 8		27 0	25 1		17 4	16 1	
" 25 ...	33 0	29 11		26 8	24 10		17 3	16 4	
Dec. 2 ...	33 3	30 6		26 1	24 7		17 4	16 7	
" 9 ...	33 3	30 9		25 7	24 3		17 3	16 9	
" 16 ...	33 2	30 7		25 3	23 9		17 4	16 10	
" 23 ...	33 1	30 7		25 2	23 10		17 4	16 9	
" 30 ...	33 3	30 5		25 1	23 9		17 4	16 9	

NOTE.—Returns of purchases by weight or weighed measure are converted to Imperial Bushels at the following rates: Wheat, 60 lb.; Barley, 50 lb.; Oats, 39 lb. per Imperial Bushel.

AVERAGE PRICES of **Wheat, Barley,** and **Oats** per Imperial Quarter in FRANCE, BELGIUM, and GERMANY, and at PARIS, BERLIN, and BRESLAU.

—		WHEAT.		BARLEY.		OATS.	
		1910.	1911.	1910.	1911.	1910.	1911.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France:	April	42 2	45 11	25 11	26 6	21 10	21 11
	May	42 1	46 9	25 9	27 2	21 10	22 8
Paris:	April	43 0	46 1	24 8	24 8	22 1	23 4
	May	44 0	49 3	24 8	25 7	22 3	23 11
Belgium:	March	35 10	32 5	23 10	24 7	19 8	19 8
	April	35 11	32 10	23 1	24 7	19 10	20 8
Germany:	March	45 7	40 6	25 9	29 0	21 3	22 3
	April	46 7	40 7	25 9	29 6	21 0	23 1
Berlin:	March	48 0	42 6	—	—	22 5	21 8
	April	48 3	42 10	—	—	21 11	22 3
Breslau:	March	44 8	37 10	25 4* 24 2†	27 7* 22 11†	19 11	20 1
	April	44 10	38 1	25 4* 24 2†	27 7* 23 7†	20 0	20 11

* Brewing. † Other.

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the German quotations are taken from the *Deutscher Reichsanzeiger*, the prices for the German Empire representing the average of the prices at a number of markets.

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of May, 1910 and 1911.

—	WHEAT.		BARLEY.		OATS.	
	1910.	1911.	1910.	1911.	1910.	1911.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London	32 4	33 4	20 2	25 4	19 3	20 4
Norwich	32 0	31 10	23 1	23 3	17 4	18 8
Peterborough	30 7	31 11	21 0	24 6	17 3	18 10
Lincoln	31 8	31 5	20 3	23 6	19 3	19 6
Doncaster	31 11	31 2	23 8	25 0	18 2	19 0
Salisbury	31 9	31 10	23 0	23 4	17 11	18 9

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND in the Month of May, 1911.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	Bristol.		Liverpool.		London.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British	14 0	13 0	—	—	13 0	11 9
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish Creamery ..	107 6	105 6	103 0	101 0	106 6	105 0
,, *Factory* ..	94 6	87 0	89 0	80 0	90 6	85 6
Danish	—	—	110 6	107 6	111 0	109 6
French	—	—	—	—	114 6	112 0
Russian	100 6	96 6	97 6	94 0	98 0	95 0
Australian	102 6	97 6	100 6	96 6	103 0	100 0
New Zealand ...	109 0	105 0	107 0	105 0	107 6	105 0
Argentine	—	—	100 0	98 0	100 0	98 0
CHEESE :—						
British—						
Cheddar	76 0	71 0	75 0	71 6	80 0	76 6
			120 lb.	120 lb.	120 lb.	120 lb.
Cheshire	—	—	66 6	61 6	82 0	76 6
			per cwt.	per cwt.	per cwt.	per cwt.
Canadian	65 0	63 0	60 6	58 0	65 6	64 6
BACON :—						
Irish	68 6	63 0	66 6	60 6	71 0	66 0
Canadian	54 6	51 6	51 6	49 0	55 6	53 0
HAMS :—						
Cumberland	—	—	—	—	110 0	100 0
Irish	—	—	—	—	103 6	99 0
American (long cut)	62 0	57 0	61 6	56 0	66 0	61 6
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British	8 9	—	—	—	9 2	8 6
Irish	8 1	7 8	7 9	7 1	8 7	7 7
Danish	—	—	9 0	8 6	9 2	8 1
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Langworthy	105 0	87 6	105 0	95 0	118 6	105 0
Scottish Triumph ...	*103 6*	*90 0*	*90 0*	*81 6*	*113 6*	*102 6*
Up-to-Date	105 0	90 0	90 0	81 6	111 6	101 6
HAY :—						
Clover	90 0	75 0	93 6	70 0	100 0	83 6
Meadow	77 6	60 0	—	—	89 0	66 6

DISEASES OF ANIMALS ACTS, 1894 to 1910.

NUMBER OF OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

Disease.	May.		Five Months ended May.	
	1911.	1910.	1911.	1910.
Swine-Fever:—				
Outbreaks	261	140	1,016	521
Swine Slaughtered as diseased or exposed to infection ..	2,828	1,644	10,797	4,676
Anthrax:—				
Outbreaks*	67	140	410	662
Animals attacked	103	168	501	813
Foot-and-Mouth Disease:—				
Outbreaks	—	—	1	—
Animals attacked	—	—	18	—
Glanders (including Farcy):—				
Outbreaks	17	27	88	151
Animals attacked	26	95	240	407
Sheep-Scab:—				
Outbreaks	10	9	297	310

* For 1910 the figures show the outbreaks reported, but for 1911 the outbreaks confirmed.

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

Disease.	May.		Five Months ended May.	
	1911.	1910.	1911.	1910.
Swine-Fever:—				
Outbreaks	4	11	49	40
Swine Slaughtered as diseased or exposed to infection ...	17	221	816	906
Anthrax:—				
Outbreaks	2	—	5	4
Animals attacked	2	—	5	6
Glanders (including Farcy):—				
Outbreaks	—	—	1	1
Animals attacked	—	—	2	2
Sheep-Scab:—				
Outbreaks	12	35	236	326

ADDITIONS TO THE LIBRARY.

[NOTE.—The receipt of *annual* publications of foreign agricultural and other departments, experiment stations and societies is not noted in the monthly list of additions to the Library. A list of these publications appeared in the *Journal* for October, November, and December, 1909.]

Agriculture, General and Miscellaneous—

East Suffolk County Education Committee.—Results of the Experiments carried out at Rendham, near Saxmundham, 1910. (11 pp.) Ipswich, 1911. [B. 46.]

Utah Agricultural Experiment Station.—Bull. No. 112:—A Report of Seven Years' Investigation of Dry Farming Methods. (93–162 pp.) Logan, Utah, 1910. [B. 56–1.]

Iowa Agricultural Experiment Station.—Bull. No. 121:—Creamery Book-keeping. (303–322 pp.) Ames, Iowa, 1911. [B. 50; G. 56–1.]

Druce, C. G.—Hayward's Botanist's Pocket-Book. [13th edition.] (280 pp. London: G. Bell and Sons, 1909. 4*s.* 6*d.* [B. 16–1.]

Plant Diseases—

University of California Agricultural Experiment Station.—Bull. No. 207:—The Control of the Argentine Ant. (51–82 pp.) 1910. [E. 40–51.] Bull. No. 208:—The Late Blight of Celery (*Septoria petroselini*). (83–115 pp.) 1911. [E. 60–7.] Berkeley, California.

Lemcke, Dr. A.—Die Verbreitung des amerikanischen Stachelbeermehltaus in der Provinz Ostpreussen im Jahre 1908. [Arbeiten der Landwirtschaftskammer für die Provinz Ostpreussen, No. 24.] Konigsberg: Gräfe und Anzer Verlag, 1909. [E. 60–25.]

U.S. Dept. of Agriculture, Bureau of Entomology.—Circ. No. 132:—The Periodical Cicada in 1911. (6 pp.) [E. 40–51.] Circ. No. 133:—The Alfalfa Caterpillar. (14 pp.) [E. 40–51.] Circ. No. 134:—Damage to Telephone and Telegraph Poles by Wood-Boring Insects. (6 pp.) [E. 40–13.] Circ. No. 135:—The Asparagus Miner. (5 pp.) [E. 40–51.] Circ. No. 137:—The Alfalfa Weevil. (9 pp.) [E. 40–51.] Bull. No. 82, *Part VII.:—Some Insects Injurious to Truck Crops.—Notes on Various* Truck-Crop Insects. (81–93 pp. [E. 40–11.] Bull. No. 95, Part II.:—*Papers on Cereal and Forage Insects.*—The Maize Billbug. (*11–22* pp.) [E. 40–51.] Technical Series, No. 19, Part III.:—Technical Results from the Gipsy Moth Parasite Laboratory, III., Investigations into the Habits of Certain Sarcophagidæ. (25–32 pp.) [E. 40–9.] Technical Series, No. 20, Part II.:—Papers on Miscellaneous Forest Insects, II., The Genotypes of the Sawflies and Woodwasps, or the Superfamily Tenthredinoidea. (69–109 pp.) [E. 40–3.] Washington, 1911.

University College of N. Wales, Bangor.—Bull. No. V.:—Potatoes—Effect of Spraying, 1910. (4 pp.) Bangor, 1911. [E. 60–37.]

New York Agricultural Experiment Station.—Bull. No. 328:—Notes on New York Plant Diseases, I. (305–404 pp.) [E. 8.] Bull. No. 329:—Chemical Investigation of Best Conditions for making the Lime-Sulphur Wash. (405–449 pp.) [E. 20–5.] Bull. No. 330:—Experiments with Home-made Concentrated Lime-Sulphur Mixtures. (451–484 pp.) [E. 20–5.] Technical Bull. No. 17:—The Apple and Pear Membracids. [E. 40–51.] *Geneva, New York,* 1910.

Kentucky Agricultural Experiment Station.—Bull. No. 147:—Common *Insecticides and Fungicides, with Directions for the Treatment of Farm* Pests. (40 pp.) Lexington, Kentucky, 1910. [E. 20–3.]

Purdue University Agricultural Experiment Station.—Circ. No. 22:—The Loose Smut of Oats and Stinking Smut of Wheat and their Prevention.

West of Scotland Agricultural College.—Bull. No. 56:—Reports on Experiments (*b*) On the Prevention of Finger-and-Toe in Turnips. (231–248 pp.) Glasgow, *1911*. [E. 60–33.]

National Fruit and Cider Institute.—Leaflet No. 5:—Potato Spraying Experiments, 1910. (5 pp.) [E. 60–37.] Leaflet No. 6:—The Use of Copper Sulphate as a Fungicide. (4 pp.) [E. 20–5.]

Stevens, F. L., and *Hall, J. G.*—Diseases of Economic Plants. (513 pp.) New York: The Macmillan Co., 1910. 8*s*. 6*d*. net. [E. 60–1.]

North Carolina Agricultural Experiment Station.—Bull. No. 212:—Prevention of Oat and Wheat Smut. (71–84 pp.) West Raleigh, North Carolina, 1910. [E. 60–21.]

Michigan Agricultural Experiment Station.—Technical Bull. No. 6:—Lime-Sulfur Spray. (15 pp.) [E. 20–5.] Circ. No. 10:—Manufacture and Storage of Lime-Sulfur Spray. (67–77 pp.) [E. 20–5.] East Lansing, Michigan, 1911.

Nevada Agricultural Experiment Station.—Bull. No. 76:—The Potato Eelworm. *(7 pp.) Reno, Nevada, 1911. [E. 40–49.]*

Massee, G., and *Theobald, F. V.*—The Enemies of the Rose. [1910 edition.] (97 pp.) National Rose Society, 1910. [E. 20–1.]

U.S. Dept. of Agriculture.—Farmers' Bull. No. 440:—Spraying Peaches for the Control of Brown-Rot, Scab, and Curculio. (40 pp.) Washington, *1911*. [E. *60–11*; E. 40–15.]

Collinge, W. E.—The Treatment of Finger and Toe Disease. [Reprinted from the Journal of the Land Agents' Society.] (4 pp.) 1911. [E. 60–33.]

Collections Zoologiques du Baron Edm. de Selys Longchamps.—Catalogue Systématique et Descriptif.* Fasc. V. (1er partie):—Megaloptera. (93 pp. +4 plates.) Fasc. XII.:—Libellulinen. (385–528 pp. and plate.) Brussels, 1911. [K. 2.]

Live Stock—

Douglas, L. M.—Swine Husbandry. (16 pp.) [Journal of Farmers' Club, January, 1911.] [F. 82.]

Nickisson, J. L.—The Government Horse-Breeding Scheme from a Farmer's Point of View. (36 pp.) [*Journal of the Farmers' Club, February, 1911.*] [F. 64–1.]

U.S. Dept. of Agriculture, Bureau of Animal Industry.—Circ. No. 168:—A Note on the Feeding Value of Coconut and Peanut Meals for Horses. (2 pp.) [F. 64–3.] Circ. No. 173:—The Sanitary Construction and Equipment of Abattoirs and Packing Houses. (247–263 pp.) [F. 72.] Bull. No. 132:—A Bacteriological Study of Ham Souring. (55 pp.) [*F. 82–3.*] Washington, *1911*.

New Hampshire Agricultural Experiment Station.—Bull. No. 152:—Feeding Sheep and Lambs: Clover Hay *v.* Native Hay; Turnips *v.* Dry Ration. (19 pp.) Durham, New Hampshire, 1911. [F. 76–1.]

Montana Agricultural Experiment Station.—Bull. No. 78:—Steer Feeding. Small Grains and Clover Hay for Two Year Old Steers. (37–48 pp.) Bozeman, Montana, 1910. [F. 68–1.]

North Carolina Agricultural Experiment Station.—Bull. No. 213:—Feeding Experiments with Cows and Calves. (85–97 pp.) West Raleigh, North Carolina, 1910. [F. 68–1.]

Louisiana Agricultural Experiment Station.—Bull. No. 124:—Part I.—Breeds of Hogs. [F. 82.] Part II.—The Best Crops to Grow for Hogs and other Data. [*F. 82–1.*] *(56 pp.)* Baton Rouge, Louisiana, *1910*.

Missouri Agricultural Experiment Station.—Circ. No. 47:—Raising Calves on Skim-milk. (99–106 pp.) [F. 68–3.] Bull. No. 90:—Fattening Cattle on Blue Grass Pasture: An Investigation of the Factors of Age, Condition, Kind of Ration and Length of Feeding Period in Beef Production. (283–388 pp.) [F. 68–1.] Bull. No. 95:—Pork Production with Forage

Crops; Clover, Alfalfa, Rape, Corn, Rye Grain, Cowpeas, Soybeans, Sorghum. (561–597 pp.) [F. 82–1.] Columbia, Missouri, 1911.

Douglas, Loudon M.—The Progress of Bacon-Curing. [Reprinted from the Transactions of the Highland and Agricl. Socy. of Scotland, 1911.] (12 pp.) 1911. [F. 82–3.]

Dairying and Food, General—

U.S. Dept. of Agriculture, Office of Experiment Stations.—Circ. 110:—Food Customs and Diet in American Homes. (32 pp.) Washington, 1911. [G. 73–3.]

U.S. Dept. of Agriculture, Bureau of Animal Industry.—Circ. No. 166:—The Digestibility of Cheese. (22 pp.) [G. 66; G. 73–3.] Circ. No. 170:—The Extra Cost of Producing Clean Milk. (119–131 pp.) [G. 56–1.] Washington, 1911.

South Dakota Agricultural Experiment Station.—Bull. No. 123:—Milk Powder Starters in Creameries. (14 pp.) Brookings, South Dakota, 1910. [G. 54–3.]

Wisconsin Agricultural Experiment Station.—Circular of Information No. 10:—Operating the Casein Test at Cheese Factories. (4 pp.) [G. 66.] No. 14:—The Determination of Salt in Butter at the Creamery. (7 pp.) [G. 60–3.] Madison, Wisconsin, 1910.

U.S. Public Health and Marine-Hospital Service, Hygienic Laboratory.—Bull. No. 41:—Milk and its Relation to the Public Health. (757 pp.) Washington, 1908. [G. 56–1; G. 56–9.]

Veterinary Science—

Canada, Dept. of Agriculture, Health of Animals Branch.—Report of the International Commission on the Control of Bovine Tuberculosis, 1910. (29 pp.) Ottawa, 1911. [H. 54–3.]

U.S. Dept. of Agriculture, Bureau of Entomology.—Circ. No. 136:—The Distribution of the Rocky Mountain Spotted-Fever Tick. (4 pp.) Washington, 1911. [H. 50–7.]

U.S. Dept. of Agriculture, Bureau of Animal Industry.—Circ. No. 174:—Eradicating Cattle Ticks in California. (281–300 pp.) [H. 18; H. 50–7.] Circ. No. 175:—The Control of Bovine Tuberculosis. Report of the International Commission of the American Veterinary Medical Association, September, 1910. (27 pp.) [H. 54–3.] Circ. No. 177:—Information for Importers of Animals for Breeding Purposes. (3 pp.) [H. 18.] Bull. No. 135:—A Comparative Study of Methods of Examining Feces for Evidences of Parasitism. (36 pp.) [H. 28–3; H. 50–1.] Washington, 1911.

Louisiana Agricultural Experiment Station.—Directions for Constructing a Concrete Dipping Vat. (8 pp.) Baton Rouge, Louisiana, n.d. [H. 28–3; M. 2.]

U.S. Dept. of Agriculture.—Farmers' Bull. No. 439:—Anthrax, with Special Reference to its Suppression. (16 pp.) Washington, 1911. [H. 36–5.]

Report of the Departmental Committee of the Board of Agriculture and *Fisheries to Inquire into Swine Fever.—Part I.:—Interim Report.* [Cd. 5671.] (16 pp.) London: Wyman and Sons, 1911. 2*d.* [H. 40–3.]

Birds, Poultry and Bees—

South Australia.—Progress Report of the Select Committee of the Legislative Council on the Export Depôt and Agricultural Departments, together with Minutes of Evidence and Appendices. (178 pp. and diagram.) Adelaide, 1910. [K. 12–9.] [*This report is limited to an inquiry into the* working of the Government co-operative egg circles.]

Butler, A. G.—Birds of Great Britain and Ireland. Order Passeres. Vol. II. (216 pp. and plates.) London: Caxton Publishing Co., n.d. [K. 8–1.]

U.S. Dept. of Agriculture, Bureau of Animal Industry.—Circ. No. 176:—A System of Poultry Accounting. (6 pp.) [K. 12–3; B. 50.] Bull. No. 110:—A Biometrical Study of Egg Production in the Domestic Fowl. Part II.:—Seasonal Distribution of Egg Production. (81–170 pp.) [K. 12–9.] Washington, 1911.

U.S. Dept. of Agriculture, Bureau of Chemistry.—Circ. No. 70:—The Comparative Rate of Decomposition in Drawn and Undrawn Market Poultry. (22 pp.) Washington, 1911. [K. 12–3.]

Royal Society for the Protection of Birds.—Feathers and Facts, a Reply to the Feather Trade, and Review of Facts with Reference to the Persecution of Birds for their Plumage. (74 pp.) London: Witherby and Co., 1911. 6*d.* [K. 8–9.]

Forestry—

Hubbard, E.—The Utilisation of Wood Waste. (192 pp.) London: Scott, Greenwood and Son, 1902. 5*s.* net. [L. 30.]

Eardley-Wilmot, S.—Forest Life and Sport in India. (324 pp.) London: Edward Arnold, 1910. 12*s.* 6*d.* [L. 8.]

Canada, Dept. of Interior, Forestry Branch.—Bull. No. 16:—Forest Fires and Railways. (8 pp.) Ottawa, 1911. [L. 20–9.]

Iowa Agricultural Experiment Station.—Bull. No. 120:—The Hardy Catalpa in Iowa. (308–325 pp.) Ames, Iowa, 1911. [L. 20–15.]

Canada, Dept. of Agriculture, Central Experimental Farm.—Trees and Shrubs Tested in Manitoba, Saskatchewan, and Alberta. [2nd edition.] (48 pp.) Ottawa, 1910. [L. 20–3.]

U.S. Dept. of Agriculture, Bureau of Biological Survey.—Circ. No. 78:—Seed-Eating Mammals in Relation to Reforestation. (5 pp.) Washington, 1911. [L. 20–9.]

Engineering—

Deutsche Landwirtschaft-Gesellschaft.—Arbeiten. Heft 172:—Vorprüfung neuer Molkereigeräte, Leipzig, 1909, und Nachweisung der in den Jahren 1887–1909 als neu ausgestellten und beschriebenen Molkereigeräte. (151 pp.) [M. 4–3.] Heft 173:—Ackerwagenprüfung Hauptprüfungen von Knochenmühlen und Invert-Spirituslampen, Prüfungen neuer Geräte 1908, 1909, und 1910, Einzelprüfungen. (119 pp.) [M. 4–1.] Heft 177:—Die Entwicklung des landwirtschaftlichen Maschinenwesens in Deutschland. (436 pp.) [M. 4.] 12 M. Berlin: Paul Parey, 1910.

U.S. Dept. of Agriculture, Office of Experiment Stations.—Circ. No. 103:—The Drainage Situation in the Lower Rio Grande Valley, Texas. (36 pp. and map.) 1911. [M. 12.] Circ. No. 104:—A Preliminary Report on the Drainage of the Fifth Louisiana Levee District. (35 pp.) 1911. [M. 12.] Bull. No. 229:—Delivery of Water to Irrigators. (99 pp.) 1910. [M. 8.] Bull. No. 230:—Report on the St. Francis Valley Drainage Project in North Eastern Arkansas, Part II.—Bench Marks. (58 pp.) 1911. [M. 12.] Washington.

U.S. Dept. of Agriculture, Office of Public Roads.—Circ. No. 93:—Bitumens and their Essential Constituents for Road Construction and Maintenance. (16 pp.) Washington, 1911. [M. 14.]

New York Agricultural Experiment Station.—Bull. No. 326:—The Modern Milk Pail. (247–281 pp.) Geneva, New York, 1910. [M. 4–3.]

Witt, G. A.—Die heiztechnischen Einrichtungen der Käserei. (669 pp.) Berne: K. J. Wyss, 1911. [M. 4–3.]

Hunt, A. J., and *Stephen, H.*—The Law of Boundaries and Fences. [Fifth edition.] (273+42 pp.) London: Butterworth and Co., 1904. 14*s.* [M. 6.]

Report of the Departmental Committee on Railway Agreements and Amalgamations. [Cd. 5631.] (49 pp.) London: Wyman and Sons, 1911. 5½*d.* [M. 18.]

U.S. Dept. of Agriculture.—Farmers' Bull. No. 438:—Hog Houses. (29 pp.) Washington, 1911. [M. 2.]

Economics—

Simmons, W. Anker.—The Comparative Advantages of Ownership on Tenancy of Agricultural Land. (20 pp.) Adjourned Discussion on the Paper. (34 pp.) [Journal of the Farmers' Club, November and December, 1910.] [N. 10–1.]

The Decimal Association.—Summary of Official Reports on the Metric System. [Second edition.] (20 pp.) London, 1911. 3*d.* [N. 38.]

Royal Agricultural College, Cirencester.—Abstract of Proceedings of Conferences on Co-operation in Agricultural Education, Experiment and Research. (24 pp.) Cirencester, 1911. [N. 4–5.]

Board of Trade.—Report of an Enquiry into Working-Class Rents, Housing and Retail Prices, together with the Rates of Wages in Certain Occupations in the Principal Industrial Towns of the United States. [Cd. 5609.] (533 pp.) 5*s.* 1*d.* [N. 22–7.] Census of Production (1907), Preliminary Tables. Part VIII. [Cd. 5621.] (55 pp.) 5½*d.* [N. 40.] Translation of the Proposed New General Customs Tariff of the Netherlands. [Cd. 5630.] (46 pp.) 5*d.* [N. 80.] London: Wyman and Sons, 1911.

Harris, G. Montagu.—Problems of Local Government. (464 pp.) London: P. S. King and Son, 1911. 10*s.* 6*d.* net. [N. 2–1; N. 26.] [This book gives a survey of the papers and proceedings of the first International Congress on Administrative Science, Brussels, 1910.]

Western Australia.—Statistical View of Eighty-one Years' Progress in Western Australia, 1829–1909. (11 pp.) Perth, 1911. [N. 44–21.]

Adams, J. C., and *Fant, J.*—Notes on Agricultural Co-operation in the Netherlands. (100 pp.) Dublin: Irish Agricl. Organisation Socy., 1910. 3*d.* [N. 4–7.]

Watson, Col. Sir C. M.—British Weights and Measures, as Described in the Laws of England from Anglo-Saxon Times. (107 pp.) London: John Murray, 1910. 2*s.* 6*d.* net. [N. 38.]

Johnson, Matt. G.—Farm Law. (140 pp.) London: Sir Isaac Pitman and Sons, Ltd., n.d. 3*s.* 6*d.* net. [N. 36.]

Bericht des Allgemeinen Verbandes landwirtschaftlicher Genossenschaften in Osterreich, 1908 and 1909. I. Teil. (140 pp.) Vienna, 1910. [N. 4–7.]

Jahres-Bericht des Verbandes der landwirtschaftlichen Genossenschaften in Steiermark, 1909. (171 pp.) Graz, 1910. [N. 4–7.]

Jahrbuch des Central-Verbandes der deutschen landw. Genossenschaften Böhmens, 1909. (141+55+11 pp. and tables.) Prague, 1910. [N. 4–7.]

South Australia, Intelligence Department.—Special Bull. No. 18:—Conditions under which Crown Lands are Allotted in South Australia, and Areas Available. (11 pp.) Adelaide, 1911. [N. 10–3.]

Internoscia, Jerome.—New Code of International Law. (1003 pp.) New York: International Code Co., 1910. [N. 36.]

Levy, Hermann.—Large and Small Holdings, a Study of English Agricultural Economics. (249 pp.) Cambridge: University Press, 1911. 10*s.* 6*d.* net. [N. 10–1; N. 14–5.]

Ehrenberg, Dr. E.—Die Arbeitsgemeinschaft des Landguts. (396–410 pp.) [Landarbeit und Kleinbesitz, Heft 11.] Berlin: Paul Parey, 1911. [N. 22–7.]

France, Ministère de l'Agriculture.—Dix Ans de Crédit Agricole. (1900–1909.) (477 pp.) Paris, 1911. [N. 6–5.]

Corner, A.—The Drift in Agriculture. (134 pp.) London: Simpkin, Marshall, 1911. 1*s.* net. [N. 2–3.]

Hewitt, C. Gordon.—Conservation, or the Protection of Nature. [Reprinted from the Ottawa Naturalist, Vol. XXIV., March, 1911.] (13 pp.) Ottawa, 1911. [N. 2–3.]

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INCREASING THE DURABILITY OF TIMBER.

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It has long been recognised that much may be done to increase the durability of timber. It is for this purpose that outside woodwork is often painted, though incidentally the appearance of the object so treated may also be improved. The intention of applying a coat of paint or similar material is to exclude moisture, because it is known that decay of wood—as of all other vegetable substances—is in some way connected with the presence of water. In a sense this is only half a truth, because wood may be saturated with water and yet may show great resistance to decay. This is illustrated by the fact that the woodwork of Roman bridges has been removed from the beds of rivers, in a comparatively sound condition after immersion for nearly 2,000 years. Similarly in the case of peat bogs, from which the trunks of trees in a perfectly sound condition are removed after having lain for many thousands of years. We have another example of the preservation of wood through the agency of water in the so-called "ponds" that one sees alongside many tidal rivers, where imported timber is often kept for years in a much better state than would be the case were it piled on shore.

The fact is that whereas moisture is a necessary condition of decay, it cannot act in this way unless assisted by air, and air is practically absent in wood that is saturated with water, as in the piles of bridges, in bog-oak, and in timber immersed in tidal "ponds." Water and air are both essential

conditions of decay, and both must be present to facilitate decomposition, that is to say, wood may be completely permeated with air, and yet will remain sound if no water is present, or it may be completely saturated with water in the absence of air, and yet show but little sign of undergoing decomposition. But if both water and air are present in wood to a sufficient extent, then the conditions of decomposition are at their best, and decay will proceed more or less rapidly, the rate depending on the temperature.

The reason for this is that the destruction of wood by the process of rotting depends on the work of living organisms, especially fungi, and just as moisture, air, and a suitable temperature are necessary factors in the growth of higher plants, so are they necessary conditions in the destructive growth of the lowly plants that induce decay in structural timber. When, therefore, a coat of paint is laid upon wood it assists in its preservation, because it excludes moisture, and, to some extent, air, but it will only be effective if the wood has been thoroughly dried before the paint is laid on. Should the wood be wet to begin with, or imperfectly seasoned, painting it may do more harm than good, because the moisture will be imprisoned and prevented escaping, and conditions favourable to decay are created and maintained.

Besides oil paint, several other substances are used to waterproof wood, such as coal tar, and although the latter is objectionable from some points of view, it makes an excellent coat, which, being more or less elastic, admits of the contraction and expansion which the wood undergoes under the influence of changes of temperature. A coating that cracks readily is quite unsuitable, because through the openings thus formed water and the spores of fungi gain an entrance, and decay is rapidly set up.

At one time—and to some extent still—posts used for gates, fences, and sheds were charred for one to two feet at the part that would come immediately above and below the surface of the ground. This part of a post has always been recognised as the point of weakness, because there—"between wind and water," as it is called—decay always begins first and progresses most rapidly. The reason for this is that near the ground level the wood draws water from the soil, while

air freely enters from above, and the conditions of decay are at their best. The lower extremity of the post is in contact with more moisture, but air is excluded by the mass of soil; while the upper part of the post is comparatively dry, although it is in free contact with air. After being for some years in position, if such a post be removed from the ground and examined, it will be found to be practically sound in every part, except at the place corresponding with the position of the surface of the ground. This, then, is the weakest part in the wood, and one way in which an attempt is made to strengthen it is by charring it. The effects of charring are due to the destruction of wood to the depth of half an inch or so, the resins, gums, tannin, &c., which this wood contains being driven in front of the heat, until they saturate a layer which then acts as a protecting mantle to the deeper wood. To be effective charring must proceed so far as to convert a considerable amount of wood into charcoal—a mere singeing or scorching of the wood will do more harm than good, as it will cause the wood to crack and thus form openings for the entrance of fungi, but will not have proceeded so far as to saturate a layer of wood with resin, &c. The destruction of the surface wood is necessarily accompanied by a weakening of the post, and it is doubtful whether, on the whole, the charring of posts is a profitable process.

Of the various methods that are practised for increasing the durability of timber, that which at present occupies the foremost place is the application of creosote. This substance owes its efficacy to the fact that it is a virulent plant poison, so that wood which contains a considerable quantity of creosote is more or less completely protected against the attack of decay-inducing organisms such as fungi. Wood, when in its natural state, holds certain substances (starch, proteins, &c.), which are the special food of fungi, but when these are saturated by creosote they are incapable of sustaining fungoid life. Creosote also acts as a preservative to some extent owing to the fact that it displaces air and water in the tissues of the wood, and these are essential to the process of decay. Many other substances besides creosote have been used as preservatives, such as copper sulphate, zinc chloride, and corrosive sublimate, but on account of their cost, or

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because they are poisonous to animals, or on account of their being easily washed out by rain, or because they corrode metal, they have all been supplanted more or less completely by creosote, except in countries where this substance is much dearer than in Britain.

On a large scale creosote is usually applied under pressure, and this process entails the provision of a somewhat costly plant. But on account of the thoroughness and rapidity with which the impregnation is carried out, the outlay on a pressure plant is justified where a large amount of timber has to be dealt with, and such plants are now to be found on many estates. In outline the process may thus be described:—The timber to be treated is well-seasoned so as to get rid of surplus moisture, and the posts (barked), rails, gates, troughs, or whatever the articles may be, are finished in every respect before being placed in the creosoting chamber. It is very important that there should be no cutting of the wood after the treatment, as this would mean interruption of the layer where most of the creosote is deposited, and water would enter, more or less freely, through this point of weakness. The articles are then loaded on to small waggons or bogies that run on rails, and are pushed into the creosoting chamber, which is essentially of the character of a large horizontal steam boiler. The door is then closed and firmly bolted, and an air-pump is set to work to reduce the pressure in the chamber. The air is thus partially removed from the wood, and when the vacuum gauge indicates a pressure of about half an atmosphere, the creosote, which should be previously heated, is allowed to fill the chamber. The air pump is now stopped, and a pressure of 80 to 85 lb. per sq. in. is applied, the creosote being thus forced into the wood. In two or three hours, or less, the wood will have taken up as much creosote as is deemed desirable; when the surplus liquid is pumped from the chamber into a suitable receptacle, the door is opened, and the bogey, with its load, run out.

The amount of creosote or other fluid that wood will absorb varies greatly with species and other causes. Heartwood takes up much less than sapwood, damp wood takes up less than dry, slow-grown pine takes up less than fast-grown,

and conifers as a rule take up less than broad-leaved trees. The wood that is subjected, more than any other, to the process of creosoting, is Baltic Yellow Deal, otherwise known as Baltic Red Wood, which is precisely the same species as Scots Pine. This is the wood chiefly used for railway sleepers and telegraph posts, so that enormous quantities have to be treated annually. As a rule the railway companies specify that each cubic foot shall contain one gallon of creosote, and for estate purposes this is as far as one can afford to go, seeing that creosote now generally costs 4*d*. or more per gallon, and therefore by the absorption of a gallon the cost of the wood is raised by this amount, apart from considerations of labour and interest on plant. Certain soft woods, however, can absorb up to four gallons of creosote per cubic foot, and many will take up two gallons. Apart from the cost, there is little to be gained by exceeding one gallon, for in the course of time the excess, beyond what the wood can really hold, will simply flow out into the soil and be lost.

The great value of creosoting for estate purposes consists in this, that it so prolongs the "life" of low-class timber as to enable such material to be used for fencing and other purposes. Spruce and Scots Pine thinnings, for instance, which will only last for three or four years if used as posts (called in Scotland stobs, and in some parts of England stumps), in their natural state will, if creosoted, remain serviceable for from twelve to fifteen years. Larch thinnings, although more durable than spruce or pine, should also be creosoted before being used as posts. There are several broad-leaved species that furnish large quantities of small wood on many estates, which, in their natural state, are not worth the labour of using for fencing purposes, and yet which are thoroughly serviceable when creosoted. To this group belong Alder, Beech, Hornbeam, Sycamore, Ash, Birch, and Poplar. Even coppice oak has little durability when in its natural state, and ought always to be creosoted before use.

On small estates the cost of erecting and working a pressure creosoting plant is prohibitive, but excellent results can be obtained by simpler methods. Many make use of an iron tank erected on brickwork in such a way that the creosote can be raised to near the boiling-point by means of a fire

underneath the tank. Immersion in such hot creosote for eight or nine hours will confer on wood most of the benefits got from two or three hours' treatment in a pressure chamber. The tank should be protected against rain by means of a light roof, and care must be taken against fire, creosote being highly inflammable.

Even a tank where the creosote can be heated is, however, a more elaborate arrangement than is necessary upon a farm or quite small estate. While heating assists in driving the creosote into the wood, cold creosote will enter almost as far, if more time be allowed. Even where only a few hundred posts (stobs) are being used, it pays well, unless the wood is mature larch or oak, to provide a tank in which the lower part of each post can be treated. Remembering that the upper part of the post will, in its untreated condition, usually last for many years, it is the lower part that chiefly requires treatment; that is to say, the posts may be set vertically in the tank, with their upper half or so above the liquid. If it is desired to treat gates, hurdles, and rails, the tank must be proportionately longer and deeper, but a very simple arrangement suffices to treat the lower half of a fencing post. An ordinary intermediate fencing post is generally placed in the ground to a depth, at most, of about 2 feet, so that the part "between wind and water" will be treated if it is immersed in creosote to a depth of 2½ feet. A suitable receptacle for the creosote is a galvanised iron tank 8 feet long, 2½ feet wide, and 3 feet deep. This will hold 150 to 200 ordinary posts placed vertically, and will when required also admit of about a dozen straining posts being laid horizontally in it. When the posts are set in the trough the liquid is fairly rapidly absorbed, and as the level falls more creosote must be added. The posts should stand in the liquid for three or four weeks, and if a fresh lot is inserted without loss of time it is evident that two to three thousand can be passed through in a year. Four ordinary posts will absorb about a gallon of creosote, so that the cost of material for each post is only about one penny, and the labour and interest on the cost of the trough is practically negligible. It is desirable that the process should be conducted away from buildings, but a

light roof should be provided to keep off the rain. Needless to say, the drier the wood to start with the better will be the results. As a 40-gallon barrel of creosote is rather inconvenient to handle, it is an advantage to construct a small platform at one end of the tank, on to which the barrels may be unloaded from the cart. One or two sheets of corrugated iron should be placed in such a position that when the posts are removed from the tank and set up to drip, the creosote that runs off shall flow back into the tank.

It is surprising how high creosote will rise in certain kinds of wood, and it is not unusual to see the material showing on the upper surface of a five-foot post when not more than two feet are immersed in the creosote.

Hop poles are almost invariably creosoted in their lower ends ("dipped," as it is called) before use, heat being generally employed in the process. Stakes for supporting fruit and other trees should also be similarly treated, and if this is done they may often be used several times over. Sheep troughs last much longer if creosoted, while the same remark applies to poultry coops, with the additional advantage that they are made distasteful to vermin.

In the *Quarterly Journal of Forestry* for 1909, Mr. E. R. Pratt, of Ryston Hall, Norfolk, describes his method of using cold creosote, and gives specifications for the construction of a concrete tank, 24 ft. long, 5 ft. deep, and 2¾ ft. wide, the total cost, including a drying stage, being £9 5*s*. In his opinion immersion for a week in cold creosote produces about one-half the effect that is obtained by treatment with hot creosote either with or without pressure. But, if time permit, a longer immersion than one week is desirable, when the results of the most simple process will be almost as good as those obtained by more elaborate and more costly methods.

THE IDENTIFICATION AND ERADICATION OF SOME COMMON WEEDS.

I.

HAROLD C. LONG, B.Sc. (EDIN.),

With Drawings from Nature by BERTHA REID.

THE part played by weeds in farm economy is now recognised by all practical farmers, and the Board have already directed attention to the subject in a widely distributed leaflet,* in which the damage done by weeds, the manner of their distribution, and the general methods which may be brought into requisition in suppressing them, have been briefly described. Other leaflets deal specifically with certain of the more troublesome weeds.

In general, botanical works only aid the reader to identify plants in the flowering or mature stage, and at such a stage weeds have usually accomplished the damage it is the farmer's object to prevent. It may be very properly said that weeds should be destroyed in their seedling stage, and for this reason some may argue that there is no necessity for their identification at all. Weeds of different species, however, not only vary considerably in the amount of damage they are able to accomplish, but also in their general vitality and the measures necessary for their eradication. Some wild plants are of so little consequence to economic agriculture that they may be neglected; other species are harmful if plentiful; while yet others may, if they once obtain a sure footing, prove an actual scourge, and involve very great labour, expense, and loss.

It cannot but be of great value to farmers and gardeners to be in a position to identify weeds—and even the cultivated crops among which the weeds grow—at all stages of their life, from the seed to the time the flowers are produced, and to have a knowledge of their life history and habits. Such a knowledge of a given weed will at the outset enable one to decide whether it is a serious pest or is unlikely to cause trouble, while it will largely suggest what type of protective and remedial measures may most successfully be adopted.

CORN BUTTERCUP.

The Corn Buttercup (*Ranunculus arvensis*, L.), known also as Corn Crowfoot, or Watch Wheels, is an annual weed of

FIG. 1.—CORN BUTTERCUP (*Ranunculus arvensis*, L.).

a, Fruit, enlarged; *b*, cotyledon stage of seedling × 1; *c*, second stage of seedling × 1; *d*, third stage of seedling × 1; *e*, flowering portion × 1.

cornfields on most soils, though it would appear to flourish best on the chalk, on heavy land. A North Lincolnshire correspondent informs the writer that the weed is there plentiful on the strong clay of the wolds, but is less common on the light soils, while it occurs in summer fallow wheat and winter sown barley more than in spring corn. In Hertfordshire and Bedfordshire also the Corn Buttercup is characteristic of clay soils.

Fruits.—The fruits (Fig. 1, *a*) achenes or nutlets of the Corn Buttercup are brown in colour, rather large (·2 to ·24 in. long by ·16 in. broad by ·04 in. thick—5 to 6 mm. long by 4 mm. broad, by 1 mm. thick), woody, flat and unsymmetrical, with hooked spines on either side, the larger spines to the outside, and from their appearance the weed is sometimes termed "watch wheels." The spinous processes may serve both to distribute the pest and to protect the seed and ensure germination. The fruits occur commonly in samples of cereal grains, and also in unmilled sainfoin, which they resemble in size and colour. One hundred large air-dried two-year-old achenes weigh 1·219 grams, equal to about 37,300 to the pound.*

Seedlings.—The early stage seedling (Fig. 1, *b*) shows the root and base of the hypocotyl (the portion between the root and the cotyledons) to be markedly divided into three or four branches or rootlets. The hypocotyl is white, stout and smooth, and slightly swollen at the junction with the cotyledons, or seed-leaves. The cotyledons themselves are pale dull green both above and below, smooth, oval or round-oval, contracting below into a broad and almost flat petiole (leaf-stalk) which is slightly hollowed above. Three distinct veins are visible below, running from the base towards the apex, one being in the centre and the other two curving outward on either side. At first the cotyledons are almost vertical, but expand until horizontal; they are $\frac{1}{4}$—$\frac{3}{10}$ in. long, and $\frac{1}{6}$—$\frac{1}{5}$ in. broad (6 to 7·5 mm. long, and 4 to 5 mm. broad).

A little later stage (Fig. 1, *c*) shows the seedling to have a tufted and fibrous root, while the hypocotyl is white or slightly tinged reddish-brown above. The first leaves are radical, and almost triangular or wedge-shaped, the broad

* *Landw. Samenkunde*, C. D. Harz, 1885.

apex being divided into three or four teeth; the leaf stalks are concave above; and the leaf has clearly marked veins or ribs running from the base to the teeth at the top of the leaf.

As the seedling grows (Fig. 1, *d*) the cotyledons expand considerably until about ½ in. long by $\frac{3}{10}$ in. broad (12·5 mm. long by 7·5 mm. broad). The true leaves are now larger, shield-shaped to triangular, with an increased number of teeth, while the later leaves are more and more deeply cut until trifid, each portion being toothed or lobed. All leaves are smooth.

Mature Plant.—The mature plant resembles the buttercups generally, the leaves being variably segmented and toothed, and the flowering stems 1–2 ft. high. The flowers are pale yellow, about ⅓ in. in diameter, and open from May to July.

Prevention and Remedy.—Care should be taken to sow cereal grain and unmilled sainfoin, which are free from the seeds of Corn Buttercup. The weed when present may be combated (1) by surface cultivation in spring to encourage germination of the seeds, when the seedlings may be destroyed by means of harrows and the hoe; and (2) by hoeing out or hand-pulling older plants before seeding occurs.

COMMON FUMITORY.

The weed known as Fumitory (*Fumaria officinalis,* L.) is an annual of 1–1½ ft. in height, but rather prostrate in habit. It is at times very plentiful on light sandy, calcareous and loamy soils, and may prove exceedingly troublesome. Brenchley found that in Hertfordshire and Bedfordshire it is characteristic of chalk land, and is occasionally "so prevalent on chalk that it is necessary to hand cultivate to get rid of it in order to save the crop. This is notably the case in the Maiden's Bower, an old Roman encampment near Dunstable." *

Holdich observes of fumitory: "This is a very common weed on certain light, sandy soils; it indicates the want of manure, and the neglect of the drill or row mode of culture." †

Seeds.—The seeds of fumitory are enclosed singly in a

* *Journal of the Board of Agriculture*, April, 1911, p. 24.

† *An Essay on the Weeds of Agriculture*, Benjamin Holdich. Edited by G. Sinclair, 3rd ed., 1825.

FIG. 2.—COMMON FUMITORY (*Fumaria officinalis*, L.).

a, Fruit, enlarged ; *b*, cotyledon stage of seedling × 1 ; *b′*, single cotyledon, enlarged ; *c*, second stage of seedling × 1 ; *d*, third stage of seedling × 1 ; *e*, flowering portion × 1.

somewhat spherical to pear-shaped nutlet or fruit (Fig. 2, *a*) which is about ·08 in. (2 mm.) in diameter, greenish to brown, with a slightly rough surface (due to the presence of minute tubercles), and two shallow dimples at the upper somewhat depressed end. The fruits are found in cereal grain samples, in clover seed samples, and sometimes in South American red clover and lucerne samples.

Ewart says that "The seeds appear able to lie dormant in the soil for a few years, coming up when the ground is broken up and seeded down, and often giving rise to complaints that a seedsman has sold seed of this plant instead of grass or clover seed." *

Seedlings.—In the seed-leaf stage (Fig. 2, *b*) the root is thin and fibrous; the hypocotyl is slender, white below and brightly tinged with red above, and smooth. The cotyledons are grass green, linear and narrow ($\frac{1}{2}$ in. long by $\frac{1}{20}$ in. broad—12·5 mm. long by 1·27 mm. broad), smooth, pointed, broadest towards the centre, and narrowing below, and with a midrib clearly visible beneath.

With further growth (Fig. 2, *c*) the hypocotyl becomes brownish-red and the cotyledons enlarge to $\frac{5}{6}$ in. (21 mm.) long; the first leaves are deeply lobed or divided and cut, smooth, and petiolate (stalked), the stalk being hollowed above and convex below.

The hypocotyl gradually changes to brown and the cotyledons fade somewhat, and the leaves are now (Fig. 2, *d*) trifid or three-lobed, and repeatedly cut and lobed.

Mature Plant.—In the flowering plant (Fig. 2, *e*) the foliage is repeatedly cut and lobed, delicately pale green, and quite smooth; the weed is sometimes nearly 3 ft. high, when it is weak and trailing in character. The flowers are irregular, and pale rose-purple in colour, occurring in long clusters or racemes placed at the end of the stem or opposite the leaves; they open from May to September.

Prevention and Remedy.—Fumitory may be combated by repeated surface cultivation during spring and early summer, and thereafter by persistent hoeing of root crops. In corn crops hand pulling may be necessary after the cereal is so high that cultivation is not practicable.

* *Weeds, Poison Plants, and Naturalised Aliens of Victoria*, Dr. A. J. Ewart, 1909.

SPURREY.

Spurrey, Corn Spurrey, Sandweed, Yarr or Pickpurse (*Spergula arvensis*, L.) must be reckoned as one of the farmer's most troublesome pests on light sandy soils, where it too often occurs in overwhelming quantity. Spurrey is usually considered as typical of light sandy soils and as an indication of the absence of lime, is an annual, and produces seed in abundance. The seed germinates readily and may give rise to seedlings an inch high in a week, and thereafter growth is rapid, and unless something be done seed is quickly ripened and scattered. The weed may invade corn crops, roots, and clover fields, and if plentiful may practically suppress spring and summer sown crops.

Over a hundred years ago William Pitt wrote of this weed: "As it is of humble growth, I have never observed it to be very injurious to a crop; but Dr. Anderson observes, that in Aberdeenshire it is a pernicious weed, growing in such abundance among the crops as to choke the grain; he has seen it so thick that over a vast extent of surface you could not have put down a pin without touching a plant, and the farmers there think it indestructible." *

Seed.—The seeds of spurrey (Fig. 3, *a*) are dull black, round, and somewhat flattened, or lens-shaped, and are surrounded with a narrow, flat wing of a pale brown colour, while the surface is rough with minute greyish-brown or yellowish papillæ. They are ·03 to ·05 in. (0·8 to 1·36 mm.) in diameter, and ·035 in. (0·88 mm.) in thickness, and Harz states that 200 large seeds weigh 0·1637 grams, equal to 597,000 per pound. They occur occasionally in European clover and grass seeds.

Seedlings.—In the seed-leaf stage (Fig. 3, *b*) the root is small and fibrous in character. The hypocotyl is whitish to very light green, cylindrical and smooth. The cotyledons are smooth and shiny, linear, cylindrical, fleshy, and light green in colour; they are at first small, but grow considerably —from ⅓ in. to 1¼ in. (8·5 to 31·5 mm.) in length.

In the next stage (Fig. 3, *c*) the cotyledons are 1 in. or over

* William Pitt: "On the Subject of Weeding; or the Improvements to be effected in Agriculture by the Extirpation of Weeds."—*Communications to the Board of Agriculture*, Vol. V, 1806.

FIG. 3.—SPURREY (*Spergula arvensis*, L.).

a, Seeds, nat. size and magnified; *b*, cotyledon stage of seedling × 1; *c*, second stage of seedling × 1; *d*, third stage of seedling × 1; *e*, flowering portion × $\frac{2}{3}$.

in length, and the first leaves closely resemble them, being light green, linear, cylindrical, fleshy, and opposite, giving a "tufty" appearance to the seedling.

As the seedling grows (Fig. 3, *d*) and the stem extends the leaves begin to appear in whorls of 6 to 8.

Mature Plant.—The grown plant (Fig. 3, *e*) is 6–18 in. high, much branched, with thickened joints or nodes. The leaves are opposite, two at each node, but owing to the presence of a pair of leaves at the base of the axillary branches, these leaves being between the primary ones, a pseudo-whorl is formed. The leaves are ½ to 1½ in. long, and awl-shaped. The whole plant has a somewhat sticky or viscid feel, and may be downy. The white flowers are borne on slender stalks in loose terminal clusters, are about ¼ in. in diameter, and open from June to August. The white petals are usually shorter than the green, pointed sepals, this rendering the flowers inconspicuous. The seed capsules are nearly round and hang downwards.

Prevention and Remedy.—Among measures which may be adopted to combat spurrey are: (1) frequent surface cultivation in spring and summer; (2) thorough and frequent hoeing both by hand and by horse labour; (3) hand pulling in some cases; (4) the sowing of late quick-growing root crops which allows more time for spring cultivation; (5) sowing "seeds" in June without a corn crop, this plan also allowing spring cultivation; (6) *thorough liming;* (7) spraying where possible with a 5 per cent. solution of copper sulphate; (8) feeding off a badly infested crop with sheep before seeding takes place.

In certain Continental countries, especially Belgium, a variety of spurrey is grown as a fodder crop, and is even sometimes converted into hay. In his *Farm Foods* Wolff quotes the following analyses of spurrey:—

	Green.		Hay.	
	Total.	Digestible.	Total.	Digestible.
Water	80·0	—	16·7	—
Crude Albumen	2·3	—	12·0	—
,, Fibre	5·3	3·3	22·0	13·1
Nitrogen-free Extract ...	9·7	6·5	36·6	23·7
Fat	0·7	0·3	3·2	1·9
Ash	2·0	—	9·5	—
Albuminoids and Amides	—	1·5	—	7·6

Very light sandy soils might be considerably improved by ploughing in several crops of spurrey in succession, for it will grow in profusion on sands where many plants would not succeed at all, and its growth is so rapid that two or three crops may be raised in one season. Ploughing in would of course be effected as soon as the weed showed the first flowers. Depasturing the crops with sheep would also be very beneficial on such soils.

THE COMPOSITION AND PROPERTIES OF CONCENTRATED FEEDING STUFFS.* (*Contd.*)

The Chief Feeding Stuffs.

LINSEED.—The chief sources of the supply of linseed are India, Russia, and America. Russian seed is smaller and also darker in colour than the Indian seed. Genuine well-cleaned linseed weighs not less than 52 lb. per bushel.

The use of linseed—as distinguished from linseed cake—among farmers is chiefly restricted to the feeding of calves. It is found that linseed meal or crushed linseed added to skim or separated milk is one of the safest and most economical substitutes for the abstracted milk-fat. Linseed approaches more nearly in composition to the solids of milk than any other food, and the oil which it contains, to the extent of 34 to 38 per cent., is easily digestible. There is, however, a risk in buying any grain or seed in the form of a meal, as it is difficult to detect impurities when the material is sold in this condition. Farmers purchasing any considerable quantity of linseed meal will be well advised to have samples analysed. One of the commonest adulterants of linseed meal is ground linseed cake. The latter does not contain more than one-sixth to one-third of the oil in pure linseed, and the relatively larger amount of fibre in it renders it unsuitable for giving to young calves as a substitute for milk fat. Again, the meal of almost any cereal grain can be mixed with linseed meal in fairly large proportions before the substitution is likely to be detected with the naked eye. The

* This and the preceding article are now issued as a revised edition of Leaflet No. 74. Though some portions of the earlier edition of the Leaflet have been retained, the bulk of this article has been written by Dr. Charles Crowther, of The

object of such admixture is at once apparent, for linseed cake and cereal meals cost, roughly, from £6 to £10 per ton, whereas the price of genuine linseed is frequently about £20 per ton. The risk would be obviated by purchasing whole linseed and having it ground at home, but the objection to this is the difficulty of grinding owing to the linseed clogging the grist-mill.

CAKES are the pressed residues obtained in the extraction of oils from various seeds and nuts, *e.g.*, linseed, cottonseed, rapeseed, cocoanuts, earth nuts, &c. Apart from mixtures of materials that are specially compressed into cakes and sold under the description of mixed or compound cakes or feeding cakes, only four distinct kinds of oil-cakes are commonly used in this country, viz., linseed cake, decorticated cotton cake, undecorticated cotton cake, and soy bean cake. To a limited extent, cocoanut cake and rape cake are also used.

Regarded as a group of feeding-stuffs, cakes may be considered as highly concentrated albuminoid or flesh-forming foods. For this reason, when consumed with a diet of straw and roots, which are essentially carbohydrate or heat-producing foods, they supply the feeding material that is most deficient. Where the straw is replaced by hay the concentrated food need not be so highly albuminoid in character, and, in that case, cereal grains may sometimes be economically substituted, partially or entirely, for cake.

Next to albuminoids the most important ingredient in cake is oil, and the price of certain sorts of cake is often largely controlled by the percentage of oil present. That the fattening capabilities of a cake are to some extent due to the oil there can be no doubt, as experiments upon sheep in this country have clearly shown the superiority of cakes rich in oil over others poor in this ingredient; but farmers should be careful that the extra percentage of oil in a cake is not purchased at too high a rate. It is well known that oil is not equally valuable from whatever source it is derived, and it is important that all the oil in a cake should be the natural product of the seed from which the cake takes its name. Thus in a linseed cake the whole of the oil present should be linseed oil.

Any substitution of mineral oils for vegetable oils must be

regarded as a flagrant adulteration, since the former have no appreciable feeding value.

Linseed and cotton cakes contain no starch or sugar, the carbohydrates being represented by mucilage and cellulose. The amount of these present in such cakes is of minor importance compared with the albuminoids and oil, because the heat-forming (carbohydrate) substance is supplied in large measure by the straw and other bulky material with which cakes are always fed. Mixed or compound cakes often contain starch and also some sugar, their ingredients comprising grain, maize, &c., and a certain amount of spice.

Cakes, if pure and well made and free from fibrous husk, are extremely digestible, often as much as 80 to 90 per cent. of the nutrient material in them being digested by cattle and sheep. The manurial residues of cakes made from oil seeds are of higher value than those of any other foods, although the residues of malt dust, dried grains, beans, and peas are not greatly inferior.

Linseed Cake.—This is the residue left after extracting the oil from linseed or flax-seed. The quality and character of the cake varies with the following conditions:—(1) The kind of linseed used; (2) the manner in which the seed has been screened and freed from its impurities; (3) the amount of pressure and the degree of heating that have been employed in the extraction of the oil and the compression of the residue into cake.

In recent years the introduction of heating processes, and, more especially, the employment of chemical agents for the purpose of extracting the oil, have resulted in placing upon the market cakes which are very hard in consistency, close in texture, and poor in oil. It will usually be found in the case of linseed cakes that as the percentage of oil increases that of albuminoids diminishes.

No oil-cake is more liable to impurity and adulteration than linseed cake, and hence in purchasing this cake, farmers should insist upon having the consignment invoiced to them as "Pure Linseed Cake," or simply as "Linseed Cake." They should not be content with such phraseology as "95 per cent. pure," "made from 95 per cent. linseed," or "made from seed pure as imported." When a cake is invoiced as

"Linseed Cake," the vendor is bound under the Fertilisers and Feeding Stuffs Act to supply cake made from linseed alone and without admixture of other seed or substance. The term "Oil Cake" is very misleading, and may apply to cakes made from a variety of materials.

The chief kinds of linseed cake are English or home-made cakes, American, and Russian or Baltic.

Home-made cakes are usually fairly soft, and of late years they have been much freer from impurities than formerly, especially when sold under the designation of "Pure Linseed Cake." In regard to quality they usually contain 9 to 12 per cent. of oil, and may be looked upon as intermediate in richness between American and Russian.

American cakes are usually rather hard and poor in oil, but are correspondingly rich in albuminoids.

Russian cakes are darker in colour than American cakes. They are usually rich in oil but are sometimes rather impure.

Rough Tests of Linseed Cake.—A rough idea as to the purity and quality of a linseed cake may be obtained as follows:—

(1) By inspection with the aid of a pocket magnifying glass and a penknife one can detect the presence of substances other than linseed when these are of fair size. As a rule, however, they are so much broken up as to be difficult of identification. The smooth, shining, dark, generally more or less triangular-shaped seeds of *Polygonum* can often be seen. The round, dark-brown husks of rape seed are familiar. The seeds of corn cockle are dark brown and very rough on the surface. Corn spurrey is a black seed with an almost smooth surface and surrounded by a delicate disc. Pieces of straw can sometimes be detected, and also sacking from the bags in which the cakes are pressed.

(2) The presence of too much sand may be suspected if the cake feels gritty when small pieces are crushed between the teeth. The flavour should be pleasing and not pungent or bitter.

(3) A jelly may be made by mixing one part by weight of the cake with six parts of boiling water. The jelly should have a mild taste and should not be bitter or rancid. If the jelly be covered up and warmed gently for some time the

presence of mustard may be detected by the smell. Cakes resulting from the chemical process of oil extraction will not always form such a jelly. They are usually very poor in oil.

Linseed cake, like the seed, is highly valued for young or weakly animals, and is commonly regarded as unsurpassable for fattening cattle.

Although some other foods, or mixtures of foods, may produce as large an increase in fattening cattle, none has the same capacity for imparting "finish" and "touch." The best feeders, therefore, generally finish their cattle on a liberal allowance of linseed cake. Should the supply exceed about 4 lb. per head per day, however, the flesh and fat produced are liable to be soft and lacking in agreeable flavour. Similarly, if more than this amount be given to milch cows, the butter-fat tends to become unduly soft and to acquire a linseed-oil flavour.

Circumstances may arise in which it becomes desirable to use home-grown grain instead of purchasing linseed cake for the fattening of cattle or sheep. The following substances may be mixed in the proportions indicated and ground in an ordinary steel grist-mill:—

8 bushels oats
4 ,, barley (or maize)
2 ,, peas
1 bushel linseed

If this mixture be given to stock with an equal weight of ground decorticated cotton cake, the whole will approximate in composition to good linseed-cake.

Cotton Cakes.—Cotton seed, as it is gathered from the plant, is covered by a dense mass of long white cotton fibres. Cotton is removed from the seed by the process of "ginning," and when this is done the cotton seed has either a smooth, dark-brown hull or husk as in Sea Island and Egyptian cotton, or is covered by a dense greenish fuzz as in American Uplands cotton, or by a close ashy fuzz or velvet as in most kinds of Indian cotton. In the process of extracting the oil the kernels may first be removed from the hulls, or the hulls may be ground in along with the kernels. If the hulls are separated from the kernels we get decorticated cotton cake; if the hulls have not been removed we get undecorticated, rough, or "English" cotton cake. The latter cake is usually

made from Egyptian or Indian seed, and the former from American seed.

Decorticated Cotton Cake.—This cake, when well made and in good mechanical condition, may be considered one of the most valuable foods at the farmer's disposal. Weight for weight, it contains a larger aggregate amount of valuable material than any other food, and, as a rule, can be obtained at a price which, in relation to its composition, is very moderate. Further, it yields richer manurial residues than any other food. At one time this cake contained as a rule 14 to 16 per cent. of oil, but the quantity of this ingredient has now dropped to about 8 or 10 per cent. Some degree of compensation for the comparative poverty in oil is the increased percentage of albuminoids, which range from about 40 to 50 per cent., but deficiency in oil is often associated with a cake that is hard and "knotty."

The average composition of decorticated cotton cake at the present time is about 40 per cent. albuminoids, 8 or 10 per cent. oil, and 20 per cent. carbohydrates. At ordinary rates this is one of the cheapest foods in the market, though it is not suitable for calves, lambs, or other young stock, unless given in small quantities, and in a finely ground condition. It is not suitable for pigs.

It is most economically employed for dairy stock or fattening cattle, and as a rule should be accompanied by about an equal weight of some starchy food like maize or barley. When fed in this way experiments have shown that this food may be usefully employed both for fat stock and dairy cows. Provided that it be not used too liberally, it is superior to linseed cake where first-rate samples of butter are required; it renders the butter firm and easily manipulated, and imparts good keeping qualities, and a high melting point; it is thus specially useful in hot weather. The very high quality of the manure made from this cake is a point that experienced farmers do not overlook. This cake is largely used in certain parts of the country, notably in Scotland; whereas in others it is rarely seen.

The chief points to be observed in purchasing decorticated cotton cake are:—(1) To ensure that the cake is made wholly from decorticated seed; (2) to see that it is in suitable con-

dition, and free from mould. With regard to the first point, the seed may not have been efficiently hulled, or the hulls may have been removed, ground up, and subsequently added to the meal, and the whole pressed into cake. Any appreciable quantity of coarse husks in the cake can be readily detected with the naked eye, but when the husks are present in a thoroughly disintegrated condition, their detection is only possible by chemical and microscopical examination. Cakes of this description exhibit a low percentage of oil (5 or 6 per cent., instead of about 10 per cent.), and a high percentage of fibre (10 to 12 per cent., instead of about 7 per cent.). Such cakes are intermediate in value between decorticated and undecorticated cotton cakes, and it is doubtful if sellers are justified in applying the description "decorticated" to some of the cakes now sold under that name. In view of the uncertainty attaching to the meaning of the term "decorticated" in this connection, purchasers of decorticated cotton cake should insist on a written statement from the seller as to the amount of fibre it contains.

The hard button-like pieces sometimes found in decorticated cotton cake are extremely objectionable. To produce a softer cake some manufacturers have lately adopted the plan of grinding up the cake and re-pressing it into shape, while in other cases it is put on the market in a ground condition, and is often known as "yellow meal." As impurities are not so easily detected in the meal as in the cake, it should be bought with greater caution. If the cake is only moderately hard, and can be passed conveniently through the breaker, it may be crushed and left exposed to the atmosphere for a few days, when it becomes softer and more suitable for stock. When exposed to the air in this way decorticated cotton cake becomes darker in colour, and it may also be noted that freshly-made cakes are much brighter than old cakes.

Undecorticated Cotton Cake.—Two classes of this cake are in common use, these being termed for convenience "Egyptian Cotton Cake" and "Bombay Cotton Cake." The chief difference between them lies in the greater proportion of woolly fibrous matter in the Bombay cakes. For this reason greater caution is necessary in using them than in the case of Egyptian cakes. Bombay cakes are, moreover,

usually rather poorer in albuminoids and oil, while they contain more sand, and are frequently "preserved" with borax. The average composition of the Egyptian cake may be put at about 23 per cent. of albuminoids, 5 or 6 per cent. of oil, and 30 to 35 per cent. of carbohydrates. The amount of fibre present is an important point; this is usually about 20 per cent., and should not rise much above that figure.

The most common faults of this cake are (*a*) the presence of too much cotton fibre, due to imperfect ginning of the raw seed; (*b*) excessive amount and coarseness of husk. After the ginning process there still remains attached to the husk a fine downy layer of cotton fibre, and this is extremely difficult to remove. Thus there is always a possibility that the seed will not be efficiently freed from such cotton, which can be easily detected by the woolly appearance of the cake when broken across. Coarseness of husk, and husk in excessive amount, are also serious objections, and have frequently been the cause of fatalities amongst stock.

The husk present in this cake possesses an astringent property which checks any tendency towards "looseness," and for this reason the cake is useful when fed along with laxative food, such as fresh young grass in the spring, and the aftermath or foggage of hay fields. In many parts of the country undecorticated cotton cake is the feeding stuff most commonly used during the grazing season.

The comparatively low percentage of oil and albuminoids, and the high percentage of fibre, render undecorticated cotton cake much inferior to decorticated cotton cake as a feeding material. Many experiments have been conducted with the object of contrasting the two kinds of cotton cake as foods for fattening cattle. The evidence thus furnished is entirely in favour of the decorticated cake, which, irrespective of its superior manurial value, was found to be worth £2 to £3 per ton more than the rough cake.

Undecorticated cotton cake is, nevertheless, a most valuable food, and is extensively used for milk cows and fattening beasts. It is not a suitable food for young animals.

*Soy Bean Cake.**—The soya, soy, or soja bean, has during

* *See* also *Journal of the Board of Agriculture*, December, 1909, p. 735; February, 1910, p. 940; and other issues.

the past year or two entered somewhat extensively into farm economy as a feeding stuff, large quantities being imported from Manchuria. According to a number of analyses, the beans contain some 35½ to 41 per cent. of albuminoids, 21½ to 27 per cent. of carbohydrates, and 15½ to 18 per cent. of oil. The oil is extracted by pressure, and the residue forms the cake or cake-meal used for cattle feeding. This cake usually contains 41 to 45 per cent. of albuminoids, 25 per cent. and upwards of carbohydrates, and 6 to 8 per cent. of oil. Some of the cake and cake-meal which is being sold has had the oil extracted from it by means of a solvent instead of by pressure. In such cases only 1½ to 2½ per cent. of oil remains, and the proportions of albuminoids and carbohydrates are correspondingly higher.

Soy bean cake may be regarded as a useful feeding-stuff when given to stock in suitable quantities and in combination with other foods. It approaches decorticated cotton cake in composition, and should be fed in the same way as that cake with starchy foods, roots, hay, and straw. A further necessity for caution in its use arises from the alleged purgative tendency of the soy bean oil.

Rape Cake.—This cake is not now much used as a feeding stuff in this country, the objection to it being the frequent presence of mustard seed, and the disagreeable flavour that it imparts to milk. It is, however, a highly nutritious food rich in albuminoids, and, if care be bestowed in its purchase, it can be advantageously given to stock, especially sheep, as the experience of several successful farmers testifies.

Cocoanut Cake.—This cake represents the residue left after pressing out the oil from the fruit-kernel of the cocoanut palm. It is used far more extensively on the Continent than in Britain, and is by many highly esteemed for milking cows. When fresh it has a pleasant nutty aroma, but soon turns rancid or acid. It has a hardening tendency upon the milk-fat. It contains a considerable proportion of crude fibre (usually 12 to 14 per cent.), but this is fairly easily digested.

Compound or Mixed Cake.—The use of cake of this description is apparently on the increase, at least in certain districts. Frequently some material, like ground linseed or cotton cake, is taken as a basis, and the bulk is made up of ground cereal

grains, such as maize, barley, &c. As a rule, the mixture is flavoured and sweetened by the addition of spice, such as ground fenugreek or aniseed. Locust bean meal is also a favourite ingredient of these cakes, and of the mixed meals sold for lamb food and similar purposes. The sweet taste and pleasant aroma which accompany compound feeding cakes, and the high degree of relish with which they are consumed by cattle, largely account for their popularity amongst farmers. Many experienced feeders use large quantities of such cakes with the best results, but they should be bought with even greater caution than is necessary in the case of pure cakes. They furnish an opportunity of getting rid of material (such as musty cake, warehouse sweepings, &c.) that cannot readily be sold in any other way, so that the buyer of compound cakes has a special inducement to deal with a firm of high reputation, and frequently to take the opinion of an experienced chemist.

BREWERS' GRAINS (or Distillers' Grains).—This material is a bye-product of the brewing and distilling industries, and represents the residues of the grains (chiefly barley) which have been converted into malt and subjected to thorough extraction with water. Grains contain all the husk of the barley and also the bulk of the albuminoids, but the greater part of the starch has been removed.

On farms in the neighbourhood of the brewery the grains are used in the wet condition as removed from the "mash tun," but for purposes of transportation to greater distances they are dried by special machinery until the moisture-content has been reduced to 10–15 per cent., and are then sold as "dried grains."

Wet grains are used practically only for milking cows, and are believed to promote the flow of milk. The opinion is general, however, that the increased yield of milk is accompanied by a deterioration in the quality of the milk if more than very moderate amounts of wet grains be fed. These opinions have not yet been adequately tested by experiment, but they receive no support from the results thus far obtained. Wet grains rapidly ferment and become sour on keeping, and hence cannot be stocked in large quantities.

Dried grains have proved to be an excellent food alike for

fattening cattle, milking cows, sheep, and horses. They seem to have a special value for sheep, excellent results having been obtained with mixtures of dried grains and decorticated cotton cake.

MALT DUST (Malt Culms, Coombs, Combings, or Sprouts) consists of the sprouts rubbed off the dried germinated barley in its conversion to malt. It is a highly digestible and palatable food, but an appreciable proportion of the material that is digested consists of amides, organic acids, and other ingredients of low nutritive value. These ingredients impart to the food a sharp, appetising flavour, however, and the condimental effect thus produced is highly valued, especially for milking cows. This food is not suitable, however, for cows when approaching the time of calving.

THE PULSE GRAINS.—These include the various forms of beans and peas, all of which are rich in albuminoids. Apart from the soy bean they are poor in oil, ordinary beans and peas containing only about 1½ per cent. They are quite different in composition from the cereal grains, being much richer in albuminoids and correspondingly poorer in carbohydrates. The great estimation in which beans and peas, in the form of meal, are held for dairy cows is due to their richness in albuminoids and the beneficial influence which they exercise upon the quality of butter. Where it is intended to fatten cattle without cake or dried grains, some addition of beans or peas to the concentrated food is considered desirable by many farmers. These foods swell up considerably when soaked in water, and hence must not be fed dry in large quantities.

THE CEREAL GRAINS.—These include wheat, barley, rye, oats, and maize, which may all be grouped together as essentially carbohydrate, or starchy, foods. They contain roughly 60 to 70 per cent. of carbohydrates, 10 to 12 per cent. of albuminoids, and 2 to 5 per cent. of oil or fat.

The only class of stock to which wheat is generally given is poultry, and for poultry feeding it is unexcelled by any single food except, perhaps, short white oats.

Barley usually commands a price in this country that precludes its being profitably used as a food for farm stock. Inferior samples, unfit for malting, may be used for the same purposes as maize.

Oats are the staple concentrated food of horses, but may be replaced to some extent by beans, maize, barley, or mixtures of these grains. A mixture of beans and maize in the proportion of about 2¾ of maize to one of beans, constitutes a food very similar in composition to oats, and may for general purposes be used as a partial substitute.

Maize is the most starchy food in the market, and is always most appropriately fed with a highly albuminoid food, such as decorticated cotton cake. As a concentrated food for general feeding purposes a mixture of equal weights of these two foods can hardly be excelled. The very small quantity of lime, and the low percentage of albuminoids in maize, largely account for its unsuitability as a food for young growing animals. When fed alone it also gives very unsatisfactory results as a poultry food.

MILLING OFFALS.—In the milling of wheat for the production of flour, a number of bye-products, commonly referred to as "offals," are obtained, and these materials furnish an important class of farm foods. They represent the outer layers (other than husk) of the wheat kernel, and range in character from a coarse bran to materials rich in floury particles ("middlings"). There is considerable divergence in the grading of these offals in different parts of the country, but for general purposes they may be grouped into the three classes of bran, sharps (or shorts) and middlings, the last-named being the most like flour in character, whilst "sharps" are intermediate between this and bran.

These "offals" are extensively used upon the farm, the finer grades being mainly used for pigs, whilst bran is everywhere used for all classes of stock, exercising a mild laxative influence which considerably enhances its value.

RICE MEAL.—The material sold under this description should be a rice bran, free from rice husk. The latter is met with in commerce under the name of "rice hulls" or "rice shudes," and so far from having any appreciable feeding value, has actually an irritating effect upon stock, owing to its richness in hard fibre (30 per cent.) and silica (18 per cent.). Its presence in rice meals, increasingly prevalent of late years, is therefore strongly to be deprecated. Genuine rice meal is a highly digestible food, rich in oil and starch. The oil, however, appears to be of low nutritive value compared with

the oils of oil-cakes. Practical experience with rice meal shows it to be best suited for pigs. It is one of the commonest ingredients of compound cakes, owing to its cheapness and richness in oil.

TREACLE, OR MOLASSES.—This is a substance which can often be very profitably employed. When of good quality it contains about 50 to 60 per cent. of sugar, and consequently has considerable feeding value, whilst it is much relished by cattle. When mixed with water, and used at the rate of a pound per head per day to moisten chaff, treacle is a very useful addition to a diet, especially when roots are scarce.

Molasses is now largely employed as a cattle food when absorbed by dried peat (moss litter) or by the pith of the sugar-cane. In this form the food is more convenient to handle than when in a liquid state. Care should be exercised, however, to avoid purchasing the convenience too dearly, where the absorbent material is highly indigestible.

A section of the Revenue Act, 1903, provides that molasses imported into Great Britain and Ireland shall not be liable to duty if intended solely for the purpose of food for stock.

COD-LIVER OIL.—Although cod-liver oil has not yet taken a place amongst the staple foods of the farm, the attention of farmers may be drawn to the fact that several practical experiments have been conducted, showing considerable success from the use of this substance as a food for calves. The function of the oil is to supply the place of cream when rearing calves on separated or skim milk. It is given to the calves after they are about six weeks old, and in quantities up to 2 oz. per head per day. Calves reared on separated milk and cod-liver oil do not gain in weight so rapidly as those fed on whole milk; but they will, if proper care be exercised, remain perfectly healthy, and they are reared at less than half the cost. It is a great advantage to continue to give the oil for some time after the milk has been stopped. The beef from animals fed in the early stages of their existence on cod-liver oil is in no sense inferior in quality to that from animals reared on whole milk. (*See also* Leaflet No. 142, *Calf Rearing.*)

NOTE.—In order to obtain an analysis of a feeding stuff which would serve as evidence under the Fertilisers and

Feeding Stuffs Act, a sample should be taken as required by the Fertilisers and Feeding Stuffs Regulations (*See* Leaflet No. 18) and a portion should be sent as required to the County Analyst. Preliminary information as to procedure can be obtained, if necessary, by addressing an inquiry to the County Analyst, and the assistance of an Official Sampler can be requisitioned. The fees payable vary in different districts.

THE DISTRIBUTION OF THE "LONG LACTIC BACTERIA" OR LACTOBACILLI.

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THIS type of micro-organism—in French and English the so-called *Bacillus Bulgaricus* type—has been known to European bacteriologists for the last fifteen or twenty years, but an increased interest has attached to it in the last few years since Metchnikoff has recommended fermented milk containing such organisms as a common article of diet. The germs have been discovered and found to be the chief active principles in such fermented milks as "kefir," "yoghurt," "leben," "mazun," "gioddu," and "koumiss." It is found that these organisms can maintain themselves under the conditions present in the human intestines, and they are believed to have a beneficial influence in controlling injurious fermentations there. A great impetus has lately been given to the trade in fermented milks in many countries, and the bacteria are now supplied commercially in different forms, as in milk, tablets, sweets of various kinds, prepared cheeses, &c.

Probably the first to isolate organisms of this type was Beijerinck, who found in Russian "kefir" a long form of lactic organism differing in some important respects from the normal milk-souring bacteria, and which he termed *Lactobacillus Caucasicus*. Then in Egyptian "leben," Rist and Khoury found two types of lactic acid-producing bacteria differing in some respects from the type discovered by Beijerinck, yet possessing the same general characters. Later, Grigoroff isolated from Bulgarian "yoghurt" two distinct strains of lactic bacilli with close resemblances to the types already discovered. One of these he termed

Bacillus Bulgaricus, a name at present very generally applied to such "long lactic" organisms. Also in Armenian "mazun," Dioggoli discovered a germ of similar characters; and in Sardinian sour milk "gioddu," Grixoni observed a long lactic type of organism.

All the cultures of long lactic bacteria obtained by different workers from the various fermented milks possess the same general characters, and such bacteria form a distinct group. Löhnis * has classed them in the *Bacterium caucasicum* group, and has lately † adopted the term *"lactobacilli,"* formerly used by Beijerinck, and for various reasons this term is preferable to "long lactic bacteria," "*B. Bulgaricus* type," &c.

White and Avery ‡ have isolated different varieties or strains of this type. They have made a comparative study of a large number of cultures of lactic acid-producing, milk-curdling bacteria from many countries, all originally isolated from Oriental fermented milks. Their results justify Löhnis's classification, and show that every culture studied must be included in the *lactobacilli group*.

The general conclusions arrived at by these investigators as to the characteristics of the bacteria of this group—the so-called *Bulgaricus* type—may be summarised as follows: All the strains show wide variations in size and are much larger than the ordinary milk-souring bacteria. They may vary in length from 2μ to 50μ and are about 1μ broad. The bacteria of this group are difficult to cultivate; growth in most media is feeble, and often obtainable only in media containing milk or whey, or in milk. Milk is the most favourable medium for growth. The optimum temperature for growth is much higher than in the case of the ordinary lactic organisms, being 113° F. or 115° F. Milk is coagulated in eight to eighteen hours at 112° F. Such organisms produce a much higher degree of acidity in milk or whey than the normal milk-souring bacteria.

Grown in whey agar all the strains show the following cultural characters: They grow equally well under ærobic

* *Gruppierung der Milchsäurebakterien, Centralblatt für Bakter.*, Bd. 18, 1907.

† *Handbuch der Landwirtsch. Bakteriologie*, 1910.

‡ *Centralblatt für Bakter.*, Bd. 25, 1909.

and anærobic conditions. They are all non-motile and non-sporogenous. They have a tendency to chain formation and to show involution forms. The cell body is often seen to contain a varying number of round to oval bodies or granules. The colonies in whey agar vary in appearance from a round to an irregular, curled, filamentous structure, with periphery mostly filamentous and often streaming, but in a few cases smooth and even. It is believed that milk is the natural habitat of the bacteria of this particular group, and that growth in the human intestines follows only upon internal administration by consuming fermented milks.

According to Hastings and Hammer,* bacteria of this type form a supposedly *new* group of organisms. As far as they are aware, no one has supposed that these organisms are commonly present in milk. While Freudenreich has found them widely distributed in Swiss milk, Swiss cheese, and whey rennet, they are not aware that they have been found elsewhere in market milk.

By microscopic examination of milk incubated in stoppered bottles at 37° C. for several days until a higher degree of acidity was obtained than was sufficient to suppress the bacteria of the common lactic streptococci type, these investigators found long slender cells appearing, which increased in numbers with increasing acidity until they were the predominant form. They found isolation of such long forms difficult, and possible only by making repeated inoculations from milk with a high acidity. By such methods they found the lactobacilli type of bacteria to be widely distributed in American milk and in American butter and cheese.

They point out, however, that in Conn's latest classification of dairy bacteria no such organisms are described, and conclude that this class of bacteria, though undoubtedly characteristic of milk, has eluded the search of American bacteriologists, and to a great extent of European bacteriologists also, because the methods employed have not been such as to attract attention to them; and that nothing is definitely known as to the natural habitat of the organisms. They believe that the significance of this group of bacteria

* *Centralblatt für Bakter.*, Bd. 25, 1909.

is unknown, and it seems doubtful whether they have any *rôle* in the ripening of Cheddar cheese comparable to that they are supposed to play in Emmenthaler cheese.*

They conclude that on account of the wide distribution of this class of organism in dairy produce in America there is always opportunity for the digestive tract of man to become seeded with them; that there is no evidence that they are found in human fæces except when consumed in large numbers in fermented milks; that it is evident the organisms do not find a favourable condition for growth in the alimentary tract, and will not be an important factor in the intestinal flora of man.

White and Avery also obtained their cultures of lactobacilli from milk only; and they also came to the conclusion that milk alone is a suitable medium. There are, however, different publications in German literature † which show that the so-called lactobacilli must be common in nature.

As growth of this type is slow in the media commonly employed in the bacteriological laboratory different workers have attempted from time to time to find a special medium better adapted for the cultivation and isolation of bacteria of this class. Cohendy has found that an extract of malt in the medium is more favourable to their growth. Heinemann and Hefferen,‡ working at about the same time as White and Avery, and previous to Hastings and Hammer, cultivated them successfully in a special medium of agar containing ·5 per cent. glacial acetic acid and 2 per cent. glucose. They proved lactobacilli to be present normally in human fæces, fæces of cows and horses, in various fermented and aromatic foods, cattle foods, saliva, normal gastric juice, various fermented milks, ordinary market milk, and in soil, manured or unmanured. They believe that these organisms are widely distributed in nature and are identical with *B. Bulgaricus, B. Boa-Oppler, B. panis fermentati,* and other bacteria supposed to belong to the class of acid-producing organisms of the mouth and intestines. This is the same conclusion as that of Löhnis.‖

* In the manufacture of Emmenthaler cheese, lactobacilli are employed as a starter.

† See Löhnis's *Handbuch der Landwirtsch. Bakteriologie*, 1910.

‡ *Centralblatt für Bakter.*, Bd. 25, 1909. ‖ *Idem*, Bd. 18, 1907.

Rubinsky furnished an important contribution to the subject in a report of his studies of koumiss.* In his exhaustive examination of this fermented milk, he found that milk containing extract of yeast was a very suitable medium for such long lactic bacteria as exist in koumiss.

The present writer, being specially interested in dairy bacteriology, and doing bacteriological work in Dr. Löhnis's laboratory in Leipzig, took advantage of the opportunities offered him to investigate, as far as the time at his disposal permitted, the distribution of these long lactic forms—lactobacilli—to find out, if possible, whether their main sphere of activity was confined to the above mentioned fermented milks, or to confirm the results of Heinemann and Hefferen, who found them to be very generally distributed.

The medium employed was "yeast whey," a modification of the yeast milk recommended by Rubinsky, and was prepared as follows: 100 grams of yeast were added to 100 c.c. of water, and this was heated in the steamer for from thirty to sixty minutes, and filtered three times. The filtrate was made up to 100 c.c. with water. To one litre of fresh separated milk at 35° C. was added a little rennet extract. After curdling this was stirred and heated to 70° C. and filtered. To the filtrate or whey 1 per cent. of peptone, ·5 per cent. of common salt, and 10 per cent. of yeast extract were added. The yeast whey was subsequently sterilised in the steamer in the usual manner. The yeast whey so prepared was found to be a better medium for the purpose than Rubinsky's yeast milk. Being transparent it admitted of direct microscopic examination of the different cultures at different periods of incubation, and of direct observation of the relative growth of lactobacilli in the cultures.

Sterile tubes of this medium were inoculated with the substances to be examined and incubated at 38° C. for several days, or until bacterial growth was distinctly apparent. Other tubes of yeast whey were inoculated from the first cultures and incubated in a similar manner. When microscopic examination had proved the long forms to be present in considerable numbers, plate cultures were made with whey agar and chalk. The lactobacilli were in this way isolated with comparatively little difficulty.

* *Centralblatt für Bakter.*, Bd. 28, 1910.

The substances examined included—

Leipzig ordinary market milk.

Swiss Emmenthaler cheese.

Deutsche cheese, Thüringer Stangerkäse.

Cheddar cheese, from Scotland.

Sauerkraut.

Human saliva.

Fæces of cows.

Soil.

The lactobacilli were proved to be present, in larger or smaller numbers, in each of the substances examined.

The medium employed seemed to encourage the growth of the long forms, lactobacilli, relatively to other types. In all cases microscopic examination of the yeast whey cultures showed that the number of lactobacilli present, relative to other types, was increased in the second culture of yeast whey, which thus formed a very effective enriching medium for this type of bacteria. In some cases the colonies of lactobacilli were almost the only ones to be observed on the Petri plates; and in some cases the colonies were clearly visible to the naked eye, along with a well-marked transparent zone due to the dissolving of the chalk, after twenty-four hours' incubation at 38° C. In other cases acid production was less rapid, and the dissolving of the chalk appeared only after several days.

Subsequently the presence of lactobacilli in comparatively large numbers in the original substances, notably in ordinary market milk, was proved in many cases by direct microscopic examination. Indeed, germs which had previously, in microscopic examination, been taken for other long forms, proved on a closer acquaintance to belong to the lactobacilli group; and such bacteria were found to be far more common than is generally supposed.

Lactobacilli were found growing in colonies quite different in appearance and outline in almost every gradation from the irregular, filamentous structure—branched colonies—to the common round, or oblong, or lobed colony. This tends to confirm the conclusions of other workers.* The form of the organism also varied from the ordinary short rod to the long

* Löhnis, *Centralblatt für Bakter.*, Bd. 18, 1907; Rubinsky, *Idem*, Bd. 28.

forms more commonly associated with the lactobacilli. It would seem that the form of the colony is in some respect determined by the form of the organism, and that this in turn is dependent upon the conditions of growth. Thus the more filamentous and spreading colonies were found to contain lactobacilli of the longer forms, and *vice-versâ*.

It would seem, therefore, that micro-organisms of the lactobacilli type are widely distributed in nature; that they occur normally almost everywhere where mixed bacteria are generally found, as in soil, air, water, foods of different kinds, milk, and other dairy products, in the alimentary tracts of human beings and animals, in human and animal fæces, &c.; that the natural habitat is not, as is commonly supposed, milk, but more especially the intestines of animals. They find there exactly the conditions to which they have become adapted, *i.e.*, a comparatively high temperature, diminished air supply, and association with other types of organisms, particularly yeasts. But the intestines of an animal consuming milk are, no doubt, a better breeding-ground for them than those of an animal which does not partake of milk. This is borne out by the greater numbers which are found in the fæces of infants and young animals on a milk diet. It is interesting to note in this connection that soured milk beverages have in olden times been prepared from goat's milk by the addition of pieces of calf's stomach. The lactobacilli, however, are present normally in numbers also in the mouths of older persons and animals, and are probably in no case entirely absent from the intestines.

The presence of such micro-organisms in dairy produce has undoubtedly a practical significance of great importance, but time has not yet permitted further investigation into this matter. The Cheddar cheese examined was a well-matured, first-class Scots Cheddar of superior flavour and general characters, and it is worthy of note that the lactobacilli were present in great numbers, in large colonies, and were by far the most numerous of the different forms of bacteria present. This was confirmed by direct microscopic examination. It would seem that the conditions present in a comparatively large Cheddar cheese during ripening—practically anærobic conditions—are favourable to the growth of

this type. It is probable that this type of germ has some important part to play in the ripening processes, and that it has an important influence on the quality of the cheese, as in the case of the Swiss Emmenthaler.

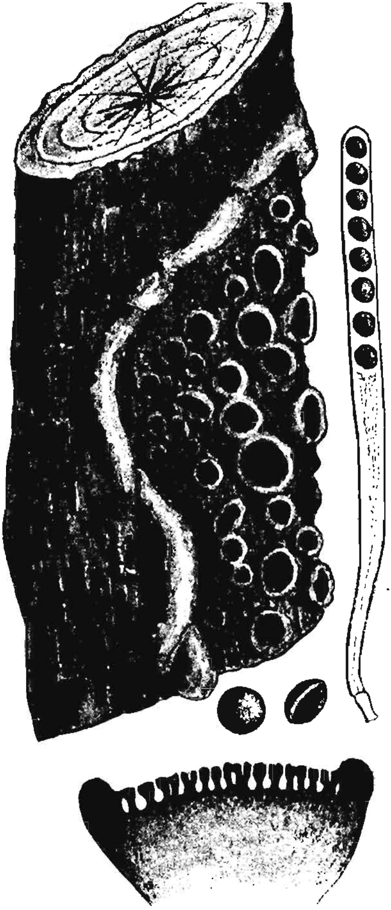
Indeed, some claim to have observed that the practice of applying farmyard manure to pasture is conducive to the production of Cheddar cheese of the best quality; while, on the other hand, the application of artificial fertilisers only is held to be responsible in some measure in some cases for an increase in the number of inferior cheeses.

While the introduction into milk of bacteria conveyed in cow excrements is to be deprecated, the judicious use in Cheddar cheese-making of a milk starter prepared from a culture of germs of the lactobacilli type, will be found to have a beneficial effect on the quality and dietetic value of the product. Lactobacilli cultures are now readily obtainable, with full directions as to cultivation, and the resulting starter may be safely used in the same way as an ordinary lactic starter, at the rate of not more than ·25 or ·3 per cent. of the whole milk. Such a starter has been used with good results. It is probable, however, that a starter containing both lactic streptococci and lactobacilli would prove equally, if not more, effective; and this will be a matter for further investigation.

BLISTER-CANKER OF APPLE TREE.

(NUMMULARIA DISCRETA, TUL.)

THE genus *Nummularia* is cosmopolitan in its distribution, and generally occurs under the form of black, hard, crust-like patches on dead bark or wood. These patches are usually quite flat, and more or less circular in outline, hence the generic name. *N. discreta* is readily distinguished from other species by the thick raised edge surrounding each patch or fruit-body, and by the compressed, circular, dark brown spores with an equatorial paler line. It occurs in France, Germany, Italy, United States, and Cuba, and was first met with in this country during the past year, on the fallen branch of an apple tree, at Sandsend, near Whitby, Yorkshire. As *a rule the fungus is a saprophyte on various trees, as elm,* magnolia, Judas tree, apple, &c., and is not recognised in



Blister-Canker of Apple Tree.
(*Nummularia discreta*, Tul.)

Europe as a dangerous parasite, but in the Mississippi Valley apple-growing region of the United States it is a constant source of danger as a true parasite. The disease is usually found upon the larger branches, and, the mycelium being perennial in the tissues, a wound once formed continues to increase in size, until eventually the branch breaks away at the wounded part, and in many instances the entire tree is killed outright.

The first indication of infection is a brown and more or less sunken appearance of the bark in patches, which are usually scattered over a considerable area. These patches eventually become dry, cracked, and blackened, and the black fruit bodies of the fungus appear, at first as small globose bodies, which gradually expand into shallow saucer-shaped structures with a thick raised margin. Eventually the dry, dead bark falls away, but the fruit bodies of the fungus remain firmly attached to the wood. The mycelium present in the wood gradually encroaches on the surrounding healthy parts from year to year, hence the canker continues to increase in area until the branch is completely girdled and consequently dies.

The fungus is a wound parasite, and as spores are produced by the fruit-bodies in great abundance, the chances of infection through wounds caused by atmospheric agencies, birds, insects, &c., are unlimited.

Owing to the fact that this fungus has proved so destructive to apple trees in the United States, it is imperative that it should be removed and destroyed when met with in this country, as judging from analogy a fungus that has hitherto been known only as a harmless saprophyte, may at any moment become a dangerous parasite.

Precautions for the Safe Working of Steam Engines and Boilers.

There is reason to believe that in agricultural districts considerable ignorance prevails with regard to the precautions which are necessary for the safe working of steam engines and boilers.

Every year serious explosions from these engines and boilers occur, through which there is loss of life or injury to persons, and frequently damage to property.

To ensure safety in the working of engines and boilers it is necessary that they should be regularly examined by a thoroughly competent person who is able to detect defects and to fix a safe working pressure for the boiler.

The best method of securing this is to insure the engine and boiler with a reliable boiler insurance company who will undertake the periodical inspections, and will advise on all necessary repairs, and on the precautions to be followed in working the boiler. The person who is placed in charge of the boiler should understand the danger of tampering with any of the safety fittings.

It should also be remembered that under the Boiler Explosions Acts, the Board of Trade order inquiries into all explosions from boilers, and in cases where they consider it necessary, public formal investigations are held.

The Courts holding these investigations have power to censure any party who is held to blame in connection with the explosion, and to order him to pay the whole or part of .he costs of the enquiry. This power is frequently exercised.

Most of the serious explosions which have occurred from agricultural boilers have arisen through the working of old or second-hand boilers which have not been properly inspected and tested for some time previously; or through the safety valve being weighted or screwed down so that the boiler was worked at a much higher pressure than it could withstand.

A case of this kind occurred recently on a farm at North Lopham, Norfolk, and in the course of the investigation by he Commissioners of the Board of Trade it transpired that he engine had been worked by a former owner after he was varned by an engineer who conducted some repairs that the oiler was unsafe, and that on one occasion afterwards it had een worked at high pressure in a crowded sale-yard. Evidence as also given showing that it was not customary to have oilers examined for purposes of safety.

The Commissioners found that the explosion occurred owing the weakness of the side of the firebox, due to wasting by treme corrosion, the thickness of the metal at the line of acture being simply that of a knife edge. They censured veral persons whose conduct in connection with the boiler

that the result of the inquiry indicated utter recklessness in the management of boilers. The individual held to be mainly responsible was ordered to pay £20 towards the costs and expenses of the Formal Investigation, the Commissioners stating that it would be well that persons dealing with dangerous articles like boilers should realise that they have no right to use them so as to endanger life.

The International Agricultural Congress at Madrid.*

THE ninth International Agricultural Congress was held this year from May 1st to 8th, at Madrid, under the distinguished patronage of His Majesty the King of Spain. These Congresses are attended by official representatives of many of the principal countries of the world, and afford valuable opportunities for the discussion of economic and scientific questions relating to all branches of agriculture, and for the interchange of views based on experience as to the best means of promoting the development of the agricultural industry. Great Britain was represented on this occasion by Sir Thomas Elliott, K.C.B., Secretary to the Board of Agriculture and Fisheries, and by Mr. T. H. Middleton, Assistant Secretary in charge of the Intelligence Division. The Congress was attended, apart from the Official Delegates, by a very large body of farmers and others to the number of upwards of a thousand, of whom Spaniards formed probably two-thirds. The enthusiasm with which the Congress was received, and the interest which it created in Spain were largely due to the labours of the Comte de Montornés, who, as President of the Committee of Organisation and *Rapporteur général* to the Congress, was untiring in his efforts to make it a success. It was to his initiative that the Congress owed not only the hearty support of the Spanish Government, but also the attendance of large numbers of representatives of the agricultural societies of Spain, which contributed so greatly to the success of the meeting. Agriculturists, not only in Spain, but everywhere else, are greatly indebted to him for the ability and public spirit which he

* A further notice on this subject will appear in a subsequent issue of this

brought to bear on the discharge of the duties which he had undertaken on their behalf.

The Congress was opened on May 1st by His Excellency Don Rafaël Gasset, the Minister in charge of the Spanish Department of Agriculture, and was favoured by an address by M. Méline,* a former President of the Council and Minister of Agriculture in France. M. Méline, after referring to the progress of agriculture during the past quarter of a century, dealt with the problem of rural depopulation, with which his name is chiefly associated, and also with the shortage of agricultural labour which is noticeable in many parts of Continental Europe.

After the opening meeting, the work of the Congress was distributed among eight sections, each of which dealt with a different group of subjects, classified as follows:—(1) Economics, which included rural depopulation, agricultural education, co-operation and credit; (2) Statistics; (3) Surveys; (4) Forestry; (5) Viticulture; (6) Fruit culture, including the cultivation of the orange, lemon and olive, and also diseases of fruit trees; (7) Breeding of live stock; and (8) Manures.

On May 7th the Congress was brought to a close by a meeting at which His Majesty the King of Spain was present. After the presentation of reports on the resolutions of the Sections, and other business, His Majesty was pleased to express, in moving terms, his recognition of the labours of the Congress.

Packing and Grading for Market.

One of the subjects discussed at the Annual Conference of the National Federated Associations of Fruiterers and Florists, held at Manchester on May 16th, 1911, was the packing and grading of fruit, and the following recommendations were made with regard to the packing of apples and broccoli:—

APPLES.

Packing.—Apples should not be purchased except packed in ½ cwt. boxes of the same type as those used in California, with the name and address of the sender, the net weight of

* M. Méline himself was unable to be present owing to illness, and the addres

the apples and the name of the apples marked on each box.

Grading.—Preference will be given, in purchasing, to packers or growers who grade their apples as "Firsts," "Seconds," and "Thirds," or roughs. The mark "firsts" should mean that the apples are even-sized, clean-skinned apples of the same colour.

For "dessert" the apples marked "Firsts" should be not less than 2½ in. in diameter.

For "cooking," "Firsts" should not be less than 3 in. in diameter.

Varieties.—The best marketable varieties to grow are:—

For Dessert.—Cox's Orange Pippin, Worcester Pearmain, Ribston Pippin, Blenheim Orange.

For Cooking.—Bramley's Seedling, Normanton Wonder, Lord Derby, Lord Suffield, Lane's Prince Albert.

BROCCOLI.

Packing.—Broccoli will not be purchased unless packed in even dozens, in non-returnable crates, after the French type.

A crate should contain two dozens, and the name and address of the sender and the number of broccoli should be stated on each crate.

Preference will be given in purchasing to growers who trim their broccoli properly before packing.

Grading.—Preference will be given in purchasing to growers who grade broccoli "Firsts," "Seconds," and "Thirds," or roughs, and who give under "first" grade close compact heads free from blemishes and of uniform size.

Egg Laying Competitions in Australia.

A party of Scottish agriculturists recently visited Australia at the invitation of the Government of the Commonwealth, for the purpose of reporting upon rural conditions in that country. An interesting Report on the tour has now been issued (Blackwood: price 1*s*.), which, in addition to a general description of the agricultural features of the various districts visited, contains much valuable information for the intending settler as well as an account of

In dealing with the poultry industry, reference is made to the well-known laying competitions which have been carried on for a number of years under Government supervision in each of the six States. The competitions date from 1901, and usually extend over twelve months. Apart from their value as a means of building up an egg-producing strain of fowls, which is the object their promoters have in view, they afford evidence of the average yield of well-bred birds, and indirectly of the "profit" or surplus receipts from the sale of eggs over the cost of food. As an example of this, the following table may be given, showing the results of some of the twelve-months' competitions in different States:—

	No. of birds.	No. of eggs laid.	Average No. of eggs per hen.	Cost of food per hen. s. d.	Net profit per hen. s. d.
New South Wales	360	63,318	173	7 0	10 2
Queensland	168	30,543	181	4 8½	10 1½
South Australia	450	80,959	179	5 4	6 4
" "	678	126,133	186	5 6	8 4
Tasmania	168	27,106	161	6 9	9 2½
Western Australia	288	50,788	176	6 8	13 3

The average production over all these competitions was about 175 eggs annually, which, considering the number of birds entered, is a very high figure. The winning pens, comprising 6 birds each, accounted for very much larger numbers, the figures in four competitions being 232, 222, 255, and 254 per hen. In fact, it is stated that for breeding purposes, very little value is attached to a bird whose score falls under the 200 standard. From 220 to 240 the birds are considered useful, while when yielding above this number they become valuable. Individual scores of 270 and 280 are not unknown. It is from the best performers in this severe test that the stock birds for the ensuing season are chosen. The same care is taken in selecting the male bird.

These egg competitions are a distinctive feature of Australian poultry-keeping, and they have exercised a great nfluence on its development, particularly by fostering the commercial or utility aspect of the industry in preference to he production of exhibition stock. Utility strains, while naintaining the type and general characteristics of the breeds, ire most carefully bred with a view to the progressive improvement of egg production, and there appears to be evidence that

this practice of careful selection has improved the production of several breeds, particularly white Leghorns. The assistance of the State in this direction has been of great value, and its supervision not only assures perfect fairness to the competitors, but gives to the tabulated results the stamp of official accuracy.

A two years' competition was held in New South Wales in 1906–8, which was won by a pen of 6 Langshans, with a score of 2,487 eggs, or 414 eggs each in two years. A three-years' test also was completed in March last, the object being to show the difference in egg production in the first three years of a hen's life. The results of the two completed years showed that the eggs produced in the second year were about one-fourth less than in the first year, the forty hens competing averaging 140 eggs per bird, as against 190 eggs in the previous year.

The sum shown as profit in these competitions represents the actual return obtained from the sale of the eggs, less the cost of the food, but nothing is charged for labour or for interest on capital. It is considered, however, that in the ordinary conditions in which poultry are kept in Australia, there is but a small expenditure on plant, while the labour would be done by the ordinary staff without extra expense. Moreover, birds at liberty gather a fair proportion of their own food from stubbles, pasture fields, and orchards, and the consequent reduction in the cost of food, together with the value of their manure may be put against the interest and labour.

The Board have been furnished by the Commissioners of H.M. Woods and Forests with the following account of the progress of the work on the Inverliever Estate during 1910:—

Report on the State Experimental Forest at Inverliever.

Time and labour did not permit of much attention to the existing woods. Work was confined to the conversion of fallen trees, and of a few oak trees into fencing material for estate purposes, and to

About 169 acres were newly planted during the season, in addition to replacing the casualities in last year's work. In all 664,100 plants were put out, of which 287,000 were purchased and 377,100 taken from the nursery at Ford. They consisted of 107,970 larch, 44,100 Scots pine, 362,450 spruce, 12,800 Sitka spruce, 10,880 Douglas fir, and 16,000 silver fir, planted on new ground, and 15,000 larch, 45,600 Scots pine, 40,000 spruce, 1,300 Sitka spruce, 7,000 Douglas fir and 1,000 silver fir put out where the previous year's planting had failed. The planting season was not very favourable, although the winter was not severe. The prolonged drought, combined with the north-east winds, have seriously affected the young plants, and will, it is feared, cause a high death-rate.

The area to be planted was thoroughly cleared of bracken, rushes, and other growth in the early summer, and where necessary was drained. More draining was required than in the previous year, and in one very wet place, about one acre in extent, the plants have been planted in the inverted sods taken from the drains.

Every effort was made to kill all rabbits inside the enclosure before the planting season. To prevent their ingress, as well as that of hares, practically the whole block has now been enclosed with wire netting. The result has been very satisfactory. Black game have again played havoc with the young plants, although men were regularly employed in trying to drive them away. They were more numerous than last year.

The area planted last season has been cleared wherever the growth threatened to suppress the young plants. The bracken has been cut over part of the ground to be taken in hand next season.

The nursery at Ford has been extended to its limit, and the whole is enclosed with rabbit-proof netting. Part of the new ground was cultivated in the summer and cleaned, and has since been filled with young plants; the remaining part is still too foul and will be cultivated and cleaned this season. In all, 431,000 seedlings have been lined out, of which 215,000

silver fir 16,500. It was not possible to obtain sufficient labour to permit of transplanting all the seedlings from the seed-beds. Purchases of seed were confined this year to European and Japanese larch and common Sitka spruce.

Sale of a Weed Seed as White Clover.

In February of this year the Board's attention was directed to a case in which seed alleged to be *Trifolium parviflorum*, Ehrh., had been offered as white clover (*Trifolium repens*, L.). On examination of samples at Kew the identification of the seed as *T. parviflorum* was confirmed. The plant, which is a native of Central and Southern Europe, is an annual and comparatively worthless. One of

FIG. 1. FIG. 2.

Fig. 1.—*Trifolium parviflorum*, nat. size and × 7. Fig. 2.—*Trifolium repens*, nat. size and × 7.

the Board's inspectors was directed to make inquiries into the matter with a view to proceedings under the Merchandise Marks Act, and samples obtained by him, which were offered as *Trifolium repens*, proved to be *T. parviflorum*, but the circumstances were not such as to make a prosecution under the Merchandise Marks Act possible.

The facts which transpired in connection with this case, however, show clearly that great care should be exercised by farmers and seedsmen when purchasing seeds about which there can be any doubt. White clover seed has been scarce this year, and misdescription or adulteration might consequently be exceptionally profitable. The Board are inform

white clover by an Austrian firm, a Hungarian firm, and an English firm. The seeds of the two species so far resemble each other that a purchaser might well be deceived unless a careful comparative examination were made, and in one instance known to the Board where *T. parviflorum* was offered to a wholesale seeds merchant for *T. repens* the difference was not at first recognised. In the circumstances it seems desirable that large quantities of white clover seed should only be purchased on a warranty, and after examination by an expert. The following observations, however, on the differences between the seeds of *T. repens* and *T. parviflorum* may be useful to purchasers of small quantities of seed or those who are obliged to rely on their own judgment:—

The seeds of *T. repens* are glossy, perfectly smooth, and rather variable in size, averaging about 1·5 mm. in length by 1·25 mm. broad (1/17 in. by 1/20 in.). They are irregularly heart-shaped, and pale golden yellow in colour when fresh and well harvested, though yellowish-brown seeds are commonly present, and a few seeds may be canary-yellow, while immature seed is greenish-yellow, and old seed may change to bright, or even dark red. Many of the seeds may show a distinct want of plumpness.

In the case of *T. parviflorum* the seeds are dull, completely covered with minute raised tubercles easily seen with a lens, and are fairly uniform in size, but much smaller than *T. repens*, being about 1 mm. long by 0·75 mm. broad (1/25 in. by 1/34 in.). They are, further, irregularly heart-shaped, and a sample recently examined was very variable in colour, some seeds being yellow or canary yellow, others reddish-yellow, light or dark green, or even black. They were also of a fairly even plumpness.

The illustration shows to some extent the difference between the two species of seeds.

A leaflet (No. 184) dealing with red, white, and Alsike clover can be obtained, post free, on application to the Secretary, Board of Agriculture and Fisheries, Whitehall Place, S.W. An article dealing with "White and Alsike Clover Seed and their Impurities" was issued in this *Journal*, April,

The following note on the actual yield of a cherry orchard in Kent has been supplied to the Board by Mr. C. H. Hooper:

The Yield of a Small Mixed Orchard in Kent.

The following is a record of yields and prices of fruit for twenty-nine years (1882 to 1910) from a grass orchard chiefly planted with cherries at Sheldwich, near Faversham, Kent. From this orchard are sent some of the best cherries that enter Covent Garden, and they are, in addition, carefully sorted and packed. In the opinion of the owner, the prices received represent the average prices obtained for good quality fruit from this district.

The area of the orchard is 4¼ acres, on loam over clay over chalk. The trees, which were mostly mature at starting, consist of 97 cherries, 61 apples, 27 pears, 96 plums, 2 quinces, 2 walnuts, altogether 285 trees, or 67 trees per acre. In the hedges surrounding the orchard there are about 50 damson trees.

The total net return from salesmen in Covent Garden in twenty-nine years is £1,762 6*s*. 5*d*., an average of £60 15*s*. 5*d*. per annum, or £14 6*s*. per acre. The owner says that, in addition, the value of fruit consumed by his household has been about £7 yearly, and he has received about £3 yearly for the grazing of the orchard by sheep.

Cherries.—The 97 cherry trees (several of which have been regrafted during the period with the best market varieties) have yielded 6,287½ half-bushels of 24 lb., selling for £1,584 6*s*. 5*d*., the average annual yield thus being 217 half-bushels, realising £54 12*s*. 8*d*., or 11*s*. 3*d*. per tree. The yield has varied from 18 half-bushels, selling for £5 8*s*. 6*d*. in 1910, to 553 half-bushels, selling for £112 8*s*. 3*d*. in 1901. The price has varied from 2*s*. 6½*d*. per half (1¼*d*. per lb.) in 1909 to 8*s*. 6*d*. per half (4¼*d*. per lb.) in 1897, the average price for the period being 4*s*. 10*d*. per half, or 2½*d*. per lb.

Apples.—The 61 apple trees have yielded, in twenty-four years, 2,133 half-bushels, selling for £211 17*s*. 6*d*., an average of 89 halves, or £8 16*s*. 6*d*. per annum, or nearly 3*s*. per tree per annum. As in the case of cherries, the variation in yield is very great. For instance, in 1885, the yield was insignificant (only 3 half-bushels), while in 1902 it was 273 halves, selling for £36 7*s*. 6*d*. The price per half-

bushel varied from 1s. 6d. in 1891 to 3s. 6d. in 1890. The average price per half-bushel for the 24 years is 1s. 11¾d.

Pears.—The 29 pear trees in 22 years yielded 1,009 halves, selling for £93 12s. 3d., an average per tree of 3s. yearly. The maximum yield was 230 halves, selling for £18 5s. in 1909. The price varied from 1s. 6d. per half-bushel in 1893 to 2s. 11d. in 1889; average price for the 22 years, 1s. 10d. per half-bushel.

Plums.—The 96 plums yielded in 12 years 436 halves, value £47 12s., an average of 36 halves per annum, selling for 79s. 4d. The maximum crop was 137 halves in 1908, selling for £10 9s. 6d. The price varied from 1s. 1¼d. per half in 1909 to 3s. 4d. in 1884, the average for the 12 years being 2s. 2d.

The two walnut trees in 29 years yielded 659 half-bushels, selling for £66 10s. 6d., average of nearly 23 halves per annum, selling for £2 5s. 9d. The largest yield was 48 halves, which fetched £5 4s. 6d. in 1897. The price varied from 1s. 1¼d. per half in 1909 to 3s. 4d. in 1884, average price for the 29 years 2s. per half-bushel.

Telephones in Rural Districts.

The Board desire to draw the attention of farmers and residents in rural districts to the following circular which has been issued by the General Post Office, explaining the advantages of the rural telephone system, and the terms on which telephones can now be provided in rural districts:—

Residents in rural districts are apt to think that a telephone is a luxury of town life which it is impossible to enjoy in the country except at a high cost. This is true if each person requires a separate exchange line, consisting of two wires over the whole distance between the exchange and his residence, to be provided for his exclusive use, but such a line is not necessary in order to enjoy most of the advantages of the telephone service. If a sufficient number of subscribers living on or near a country road leading to a town where there is a telephone exchange will agree to use one line, they can telephone as much as they please to people on that exchange for the moderate fixed charge of £3 a year.

In the United States there are to-day more telephones in use by farmers than the whole number in use by the commercial and all other classes in the United Kingdom, and these telephones are found to add to the profits and comfort of the farmers to an extent which makes the cost of the telephones seem negligible.

The Postmaster-General is ready to provide lines of the same kind in the rural districts of the United Kingdom. By means of such a line a farmer can speak from his farm to all the people who are telephone subscribers with whom he does business, not only in the nearest town but also as a rule in all places within a distance of about 100 miles. He can also send messages and receive replies by telephone when his correspondents are not telephone subscribers, or he can get them to speak to him from a public call office. If a machine is broken he can order a new part without the trouble of a journey into the town or the delay of sending an order by post. He can get the latest information as to market prices, and arrange to the best advantage for the sale of his produce and stock, and he can get any weather reports and forecasts which he may want to guide him when crops have to be gathered. In the case of illness a doctor can be summoned, or a veterinary surgeon for his horses and cattle. If a fire occurs assistance can be called. He can speak to any neighbouring railway station and arrange for the despatch or delivery of his goods and produce. He can despatch a telegram without the trouble of sending a messenger to the telegraph office, and he can receive his telegrams by telephone without waiting for a messenger to bring them out, and he can also call a messenger to take an express letter. In a short time the telephone becomes the most valued implement of the farm.

Co-operative movements among farmers for the use of central dairies and creameries, or for the collection and distribution of produce, can only be worked to the best advantage if a telephone service is available to bring the farms of members into direct communication with the central estab-

which otherwise would involve inconvenient and expensi journeys to neighbouring towns, or which he could not d at all owing to the delay involved in reaching the othe parties concerned. When his work is over he and his famil can talk to their friends and neighbours, and can eve arrange social meetings which would otherwise be impossibl In many other ways, too numerous to mention, the telephon helps him to overcome the chief drawbacks of country lif and enables him to do business on as good a footing as if h lived in a town.

If you would like to have a telephone service of this kin in your district, please write to the Secretary, General Pos Office, London. Before you do so try to interest your neigh bours in the scheme, and find out how many are willing t join at the rate of £3 per year for unlimited calls on thei own exchange, and with the power of talking to other towns at the rate of 1*d.*, 2*d.*, 3*d.* per conversation, according to the distance for towns within 25 miles and at the rate of 6*d.* for towns within 50 miles.

To make the scheme practicable a minimum of five subscribers is required, with an average of three subscribers per mile of route from the telephone exchange. Full particulars will be sent to you by post, and, if there is any prospect of a successful scheme, a representative will come to discuss the matter with you personally.

SUMMARY OF AGRICULTURAL EXPERIMENTS.

SOILS AND MANURING.

Calcium Cyanamide and Nitrate of Lime (*Roy. Agric. Coll., Scientific Bulletin, No.* 2, 1910).—Four nitrogenous manures were compared on oats. The plots were each $\frac{1}{10}$ acre. and each manure was used on two different plots. A dressing of mineral superphosphate, at the rate of 3 cwt. per acre, was given to all the plots except the unmanured, sulphate of ammonia was used at the rate of 1 cwt. per acre, and the other manures in quantities containing the same amount of nitrogen as 1 cwt. sulphate of ammonia, viz., nitrate of soda, 147 lb.; nitrate of lime, 176 lb., calcium cyanamide, 140 lb. The results per acre, taking the average of the two plots in each case, were:—

	Grain. Bushels of 40 lb.	Straw. Cwt.
Unmanured	43	16¾
Nitrate of soda	47½	18
Sulphate of ammonia	48¾	20¾
[illegible]	[illegible]	[illegible]

Composition of Sawdust (*Roy. Agric. Coll., Cirencester, Scientifi Bulletin, No.* 2, 1910).—The use of sawdust as litter, and, consequentl as a constituent of manure, makes its composition, as regards nitroge and ash constituents, of interest to agriculturists. The sawdust of th wood of various trees, obtained from sawpits, was examined at th College. The water in the sawdust, as received, varied from 6 t 13 per cent. In the dry matter the nitrogen varied from 0·14 per cen to 0·30 per cent., and the mineral matter from 0·25 per cent. to 1·38 pe cent. Assuming the presence of 10 per cent. of moisture, the mea result is 0·2 per cent. of nitrogen in the sawdust.

Manuring of Potatoes (*Univ. Coll. of N. Wales, Bangor, Agric. Dept Bul.* 8, 1910).—This experiment has been carried out for the last thre years, at six centres each year. Taking the average for the three year the average crop of marketable potatoes from the unmanured plot ha been 4 tons 2½ cwt. Ten tons of farmyard manure per acre have pro duced an increase of 2 tons 19 cwt., and 20 tons of farmyard manur have given an increase of 4 tons 2 cwt. There is little doubt that th extra ten tons could be used with more effect elsewhere. The highe yield (9 tons 10½ cwt. per acre) has been obtained from 10 tons of farm yard manure supplemented by a complete dressing of artificials, viz. 202 lb. sulphate of ammonia, 524 lb. superphosphate, and 164 lb sulphate of potash per acre. These artificials cost £2 12s. per acre, an increased the yield by 2 tons 9 cwt. per acre, so that the extra quantity o marketable potatoes was obtained at a cost of a little more than £1 pe ton. Professor Winter states that, looking at the experiment as a whole it is clear that 20 tons of farmyard manure per acre cannot be economicall applied, although 10 tons per acre is not enough to produce a full cro of potatoes. The returns on the plots where the smaller amount of farm yard manure, along with an incomplete dressing of artificials, was use were relatively satisfactory. The plots that received the complete dress ing of artificials in addition to 10 tons farmyard manure gave the bes result.

Manuring of Permanent Grass Land (*Roy. Agric. Coll., Cirencester, Scientific Bulletin, No.* 2, 1910).—This experiment has been carried out on the same land for over twenty years. A summary of the results from the beginning was given in the *Journal* for August, 1910, p. 399. The soil varies considerably in depth and texture, and in the amount of carbonate of lime contained in it.

In 1910 the unmanured plot gave over 25 cwt., a crop that has been exceeded in only two previous years. Two plots with 12 tons of farmyard manure annually gave an average increase over this of 18¾ cwt. The artificials were applied in the following quantities per acre:—Nitrate of soda, 2½ cwt.; sulphate of ammonia, 2 cwt.; superphosphate, 5 cwt.; kainit, 5 cwt.; and with these quantities a yield of over 2¼ tons, or about 20 cwt. more than from the unmanured plot was obtained from various combinations. Ten cwt. of basic slag alone improved the quality of the herbage, but had little effect on the quantity.

A preliminary botanical examination of the growth in the field has been made. On the unmanured plot, and on the plots receiving kainit alone and nitrate of soda alone, the number of flowering species found

On this last plot there were no buttercups, and 13 of the species were grasses and leguminous plants. On the unmanured plot the ratio of the weight of grasses to leguminosæ was 9 to 1, and of the latter nine-tenths was *Lathyrus pratensis*.

With kainit alone and kainit and superphosphate the proportion of leguminosæ was about the same, but the most abundant plant was white clover. Where nitrate alone and the complete mineral manure were used, the proportion of leguminosæ was reduced. Of the grasses, Upright Brome (*Bromus erectus*) was the chief on all plots, the smallest proportion of it (about 70 per cent.) being on the plot receiving a complete mixture of artificials. Where it had decreased, its place among the grasses was mainly taken by cocksfoot and fescues.

FIELD CROPS.

Growth of Linseed (*Univ. Coll. of N. Wales, Bangor, Agric. Dept., Bul.* 7, 1910).—Linseed is used on almost every farm for calf-rearing and other purposes, and, as it has been selling at a high price for some considerable time, a series of trials was arranged to see if it could be profitably grown by the farmers themselves. A quarter of an acre was sown on each of eleven farms in North Wales. The seed was sown about the end of April, at the rate of 104 lb. per acre, and was covered very lightly. Linseed does not ripen like corn, but produces flowers and ripe seeds at the same time, and it is harvested when most of the flowers have formed pods, and when the oldest pods are quite ripe and dry. On most of the farms the crop grew well, but after flowering went down a good deal on account of rainy weather. The crops varied considerably, from 48 lb. on the quarter acre at one centre, where it was beaten flat by the rain, and damaged after cutting by bad weather, to 407 lb. at another centre. In the majority of cases good crops were produced, and the average from the quarter acre was about 2 cwt. Professor Winter considers that if linseed remains at its present high market price, there can be little doubt that it would pay many farmers to grow what they require for their own use, and possibly, in some cases, it might be grown successfully on a commercial scale.

Varieties of Oats (*Roy. Agric. Coll., Cirencester, Scientific Bulletin, No.* 2, 1910).—A trial of five varieties of oats was made on the College farm in 1910, on plots between a quarter and a third of an acre in size. The yields per acre were:—

	Grain. Bushels of 40 lb.	Straw. Cwt.
Banner	82	45
Abundance	77	39
Thousand Dollar ...	71	36
Newmarket	66	44
Black Tartar	58	41

Black Tartar weighed only 31 lb. per bushel. An analysis of the grain of each variety is given in the report.

A Russian Method of Corn Cultivation.—Reports of experiments carried out at Bromberg, in Germany, to test the efficacy of the method of corn cultivation advocated by M. Demtschinsky have appeared in this *Journal* for December, 1909, and February, 1911. The account of the following experiments conducted at Weihenstephan, in 1909 and

1910, taken from the *Praktische Blätter für Pflanzenbau*, &c. (April, 1911), may be given for purposes of comparison.

The earthing-up method only came under consideration, the trials being made on winter barley. Three plots of the same size, each in duplicate, were selected on a heavy loam, and were manured in the autumn of 1909, before seeding, with basic slag and potash. A top-dressing of nitrate of soda was given on May 3rd, 1910. Sowing took place on Sept. 3rd, 1909. Plot 1 was sown in the ordinary way, at the rate of 120 lb. of seed per acre, the seeding being done as evenly as possible, in drills 8 inches apart, at a depth of 2 inches, and the seeds were covered over with earth so that the plot presented a level surface. On plots 2 and 3 a seed was sown at every two inches, the drill being two inches deep. The plants appeared on 10th Sept., 1909, and earthing-up took place on plot 2 twelve days after sowing, and on plot 3 seventeen days after sowing. In April, 1910, the plants on all plots were hoed. In the spring the development of the ear of barley in the earthed-up plants was behind that of the plants on plot 1.

Harvesting was carried out on July 5th, 1910, and the following yields per acre were obtained:—

	Grain. Cwt. per acre.	Straw. Cwt. per acre.
Plot 1	41	55
" 2	39	48
" 3	50	66

The best results were, therefore, given by earthing-up at the later date, while the yield from earthing-up at the earlier date was not so good as that from the ordinary method of cultivation. An examination of the number of ear-bearing stems per plant also showed the superiority of plot 3. The saving of seed effected by the Demtschinsky method was at the rate of 80 lb. per acre. The general result confirms that of previous experiments to the effect that the extra yield which may sometimes be obtainable by this method is insufficient to compensate for the extra labour.

Seeds Mixtures for Permanent Pasture (*Univ. Coll. of N. Wales, Bangor, Agric. Dept., Buls. 2 and 4*, 1910).—Experiments with four different mixtures for laying down permanent pasture were started in 1906, at nine farms. The plots were mown in 1907 and 1908, and a very satisfactory hay crop was given by a mixture containing a considerable quantity of rye grass and more red clover than the others. This mixture approached more nearly to the mixtures usually sown by farmers than the other three, and cost £1 0*s*. 11*d*. for 31½ lb. per acre. The heaviest hay crop was given by a mixture recommended by Mr. R. H. Elliot, of Clifton Park, Kelso, which contained no perennial rye grass, but a larger number than usual of other pasture plants, including burnet, chicory, and kidney vetch, which are deep-rooting plants that may be useful in dry seasons and on light soils. This, however, weighed 47½ lb. per acre, and cost £2 9*s*. 9*d*. The plots were grazed in 1909 and 1910, and inspected in June, 1910. Two of the mixtures were found to have given a good close bottom and a fairly large amount of herbage, particularly suitable for grazing with sheep. These were Mr. Elliot's mixture and another having the following composition: Italian rye-grass, 4 lb.; perennial rye-grass, 6 lb.; cocksfoot, 4 lb.; meadow fescue

3 lb.; meadow foxtail, 2 lb.; timothy, 2 lb.; crested dogstail, ½ lb.; hard fescue, 1 lb.; tall oat grass, ½ lb.; rough-stalked meadow grass, ¼ lb.; smooth-stalked meadow grass, ½ lb.; yarrow, ¼ lb.; broad red clover, 2 lb.; alsike, 1 lb.; white clover, 2 lb. The weight of the latter mixture sown was 28¾ lb. per acre, at a cost of £1 2*s.* 4*d.*

A second series of plots was started in 1909, at five farms. Three of the mixtures were the same as those used in the former experiments, but instead of the fourth, a modification of Mr. Elliot's mixture is being tried, the cost being reduced, chiefly by omitting burnet, sheep's parsley, and kidney vetch, and introducing perennial rye-grass. The cost of this mixture, at the rate of 37¾ lb. per acre, was £1 16*s.* 11*d.* The grass was cut for hay in 1910, when Mr. Elliot's original mixture gave the best crop, and the modification of it the next best.

LIVE STOCK, AND FEEDING STUFFS.

Feeding Animals with Dried Potatoes (*Mitteilungen des K.W. Inst. für Landw., Bromberg*).—These experiments were carried out at two centres in Germany in 1904, 1906, and 1907. One trial was conducted on 18 steers, averaging about 7 cwt. each in weight, of which 9 were fed for 127 days on fresh potatoes, and 9 on dried potatoes, the other foods fed being the same for both lots of animals. The analysis of the dried potatoes gave the following result:—Water, 11·22 per cent.; crude fat, 0·48 per cent.; crude protein, 6·55 per cent.; nitrogen-free extract, 74·35 per cent; crude fibre, 3·37 per cent.; and ash, 4·03 per cent. The content of pure albuminoids was 4·47 per cent., of which 3·80 per cent. was digestible. The amounts of potatoes fed per 1,000 lb. live weight per day were 50 lb. fresh potatoes and 16 lb. dried potatoes, these amounts having the same food value. The increases in live weight during the experimental period were 2·427 lb. in the case of dried potatoes, and 2·206 lb. in the case of fresh potatoes per head per day. Similar experiments were conducted in 1904 on pigs, steamed potatoes being compared with dried potatoes in the ration. The results were very slightly in favour of steamed potatoes.

In 1907 and 1908 trials with swine were undertaken to compare the feeding value of two kinds of dried potatoes with that of maize. The pigs were divided into three lots, the rations of each lot containing one of the foods under trial. The greatest increases in weight were caused by dried potato flakes (*Kartoffelflocken*), and next in order, maize, with dried potato slices (*Kartoffelschnitzel*) last. The explanation of the difference between the two potato foods lies in the fact that the starch in the dried potato slices is not digested so well as in the dried potato flakes. The meat and fat of the animals fed with the potato foods were quite as good as those of the lot fed with the maize.

To ascertain the limits to which feeding with dried potatoes can be carried six lots of six pigs each were chosen, two lots being fed with 10 lb. of dried potato flakes and dried potato slices, respectively, per 1,000 lb. live weight per day, two lots with 17½ lb., and the remaining two lots with 25 lb. Dried potato flakes again proved superior to dried potato slices, but no very decided advantage was obtained from the larger quantities. The largest quantity of dried potato flakes

the animals up to the end of the experiment. On the other hand the two larger quantities of dried potato slices (17½ lb. and 23 lb. per 1,000 lb. live weight per day) were refused before the end of the experiment, and the smaller quantity had to be reverted to.

The general conclusion reached by Dr. Gerlach as the result of these trials is that these dried potato foods (which are largely used in Germany) form an excellent feeding-stuff for all kinds of stock, and may with advantage be used in preference to raw potatoes when the latter have sprouted or are otherwise of inferior quality. The practice of potato-drying derives its value from the circumstance that it enables a farmer to preserve his surplus stock of potatoes for an indefinite period.

The Effect of Albuminoids on the Fattening of Full-grown Animals (*Die Landw. Versuchs-Stationen, Band lxxiv. Heft. vi.*).—Certain experiments carried out by Professors Pfeiffer and Friske, in 1908, had given results which, contrary to previous observations, showed that a substantial production of albuminoids may take place in the feeding of adult animals, even though the ration is not particularly rich in nitrogen. The experiment was repeated in the winter of 1909-10, on a number of wethers of from 3¼ to 3¾ years of age. Two animals were fattened on foods with a high content of albuminoids and two on foods with a low content of albuminoids. The foods used were hay and bruised barley and beans.

The amount of nitrogen in the food converted into flesh was estimated by deducting the amount of nitrogen in the liquid and solid manure and wool from the amount of nitrogen in the foods fed, these amounts in each case being obtained by careful analysis. With the results obtained by such a calculation were compared the actual results obtained by slaughter of the animals and analysis of the various parts of the carcasses. In the latter case, the amount of nitrogen present before fattening was estimated from the amount of nitrogen in the carcasses of three unfattened animals, which were killed for the purpose at the beginning of the experiment.

The results of the experiment may be summarised as follows:—A considerable production of nitrogen in the form of flesh takes pla in fattening full-grown animals. The worse the condition of the anim (as regards nourishment) before fattening, the greater is this producti of nitrogen.

A lowering of the albuminoid ratio of the ration exercises, in t long run, no influence on the meat production of adult animals. wide albuminoid ratio is equal in this respect to a narrow one, thou the former may possibly be superior. That is to say, in these expe ments no practical difference was found as regards flesh producti between the foods with a high and low proportion of albuminoids.

The production of nitrogen in the animals as a result of fattenir was, as a general rule, found to be higher when estimated by calculati than when obtained by actual slaughter. Only in the case of foo with the smallest proportion of albuminoids was there a noticeat agreement in the figures obtained by the two methods.

Soy Bean Cake for Fattening Cattle (*Roy. Agric. Coll., Cirenceste Scientific Bulletin, No. 2*, 1910).—A trial of soy bean cake in comparis with decorticated cotton cake was made on two lots of bullocks, co

barley meal, but one lot received 4 lb. daily of soy bean cake, and the other 4 lb. of decorticated cotton cake. The increase made by each lot was the same, and it is concluded that the two foods are of equal value for fattening, while the cost of soy bean cake is lower than that of decorticated cotton cake.

DAIRYING.

The Cellular Elements present in Milk (*Jour. Brit. Dairy Farmers' Assoc., Vol. 25, 1911*).—This investigation has been continued with the milk of animals other than the cow. Samples of milk from the ass and the goat, and a few samples of human milk were examined. The ass is a type of animal in which milk production has not been developed by breeding and selection, so that lactation is in no way "artificial," while the animal is docile and stolid. The goat is more of the type of the cow, but the milk-producing power has not been developed to such a degree. The conditions observed in the milk were very much in accordance with these characteristics. The cell count was very low and uniform in the ass's milk, and rather less so in the goat's milk. The opinion of the investigators is that these results tend to confirm the conclusions already arrived at. A uniform type of life tends to a fairly uniform excretion of tissue cells from the udder, but in the cow the udder must be looked upon as an organ which has by breeding and selection been brought to an artificial condition of milk secretion, and this has been accompanied by a stimulation of the tissues to cell proliferation, and a consequent liability to increase of the cellular elements which is not necessarily significant of disease.

Difference in the Amount of Fat in Morning and Evening Milk owing to Unequal Intervals of Milking (*Proc. Univ. Durham Philosophical Soc., Vol. iv., Pt. I.*).—It is well known that afternoon milk is richer in fat than morning milk, and that this difference is largely, if not wholly, due to the shorter time from the morning to the afternoon milking. In this paper Mr. S. H. Collins has collected together the results of a large number of investigations of the composition of milk in order to find the amount of difference in the proportion of fat that is caused by various intervals between the milkings. The results arrived at are as follows:—

Interval between milkings.	*Difference in milk.*
12 and 12 hours, *e.g.*, 6 a.m. and 6 p.m.	Morning milk richer in fat than evening milk by 0·18 per cent.
13 and 11 hours, *e.g.*, 6 a.m. and 5 p.m.	Evening milk richer than morning milk by 0·33 per cent.
14 and 10 hours, *e.g.*, 6 a.m. and 4 p.m.	Do. by 0·70 per cent.
14½ and 9½ hours, *e.g.*, 6 a.m. and 3.30 p.m.	Do. by 1·09 per cent.

On the average, if a herd be milked 12 minutes earlier in the morning and 12 minutes later in the evening, the milk will be richer in fat by 0·1 per cent. in the morning, and correspondingly poorer in the evening.

Foodstuff Requirements of Dairy Cows (*Arbeiten der Deut. Landw. Gesell., Heft 171*).—*Experiments carried out by the German Agricultural Society to ascertain the starch equivalent and albuminoid requirements of dairy cows are reported in this publication by Dr. Hansen.*

The amounts of these substances were determined in foods fed to 160 dual purpose cows.

Foods were fed representing three different quantities of starch equivalent, viz., 12·6 lb., 14·3 to 14·4 lb., and 15·6 lb. per 1,000 lb. live weight per day. The small quantity of 12·6 lb. proved insufficient either for obtaining the greatest milk production possible or for causing any appreciable increase in live weight. A milk production of about 31 lb. to 35 lb. per cow per day, however, resulted from feeding at the rate of 14·3 to 14·4 lb. of starch equivalent to 1,000 lb. live weight, and at the same time the animals became ready for the butcher. Foods containing 15·6 lb. per 1,000 lb. live weight were accompanied by a milk yield of 44 lb. to 46 lb. per cow per day, but the cost of such foods make this quantity unprofitable.

Five different quantities of albuminoids were fed (the starch equivalent remaining constant):— 2·1 to 2·2 lb., 2·5 to 2·7 lb., 3·0 to 3·2 lb., 3·5 to 3·6 lb., and 4·2 lb. per 1,000 lb. live weight per day. With regard to milk production, at least 2·5 lb. of albuminoids were found to be necessary, but a greater milk production resulted from the use of 3 to 3·2 lb. albuminoids. Whether it is more profitable to use this quantity than the lower amount will depend upon the prices of the foods. No remarkable increase in the milk yield from the use of 3·5 to 4·2 lb. albuminoids was obtained, and Dr. Hansen does not recommend these large amounts. The *percentage* fat content of the milk remained the same, whatever quantity of albuminoids was fed. The different quantities of albuminoids, therefore, had the same effect on the *total* amount of fat as on the milk yield.

For combined fattening and large milk production, large quantities of albuminoids were shown to be unnecessary. The most profitable quantity is 2·5 lb. to 2·7 lb. per 1,000 lb. live weight per day; a small quantity, say, 2·1 lb. to 2·2 lb., is insufficient. Contrary to expectation, the greatest increase in live weight was made when the animals were giving their greatest milk yield; the increase in live weight became less as the end of the period of lactation approached.

Effect of Palm Nut Cake on Milk Production (*Mitteilungen der Deut. Landw. Gesell., April 15th,* 1911).—Experiments on the Continent with regard to the effect of palm nut cake on milk production have, in the past, given very contradictory results, and a thorough investigation has therefore recently been made by Professor Kellner with a view to obtaining definite conclusions on the subject.

A very extensive series of experiments was organised, trials being carried out at nine of the most important experiment stations in Germany; and as a rule a different breed of animal was tested at each station. At each trial 20 cows were used, all in the first six months of the period of lactation, and these were fed for 30 days on a mixture of earth nut meal and crushed maize, for 30 days on palm nut cake and meal, with the same content of digestible albuminoids and carbohydrates as the earth nut meal and maize, and then for 30 days again on earth nut meal and crushed maize. In addition, foods containing sufficient albuminoids and carbohydrates were fed during all three periods, the content of the foods in each of these substances being kept at the

different animals. The milk yield from palm nut cake was greater at five stations and less at two than the yield from earth nut cake and maize. Although, on an average there was an increased yield from palm nut cake of 0·22 lb., per cow per day, it is concluded that no increase in the milk yield from the use of this feeding stuff can be reckoned on.

In every case, however, a considerable increase in the content of fat, whether reckoned in absolute figures or as a percentage of the quantity of milk, resulted from replacing earth nut cake and maize by palm nut cake. The effect was not noticeable, however, until some time after the change of feed, the maximum increase in fat content being reached in from 14 to 20 days. It was also found that the higher the milk yield of the cow, the more noticeable was the effect of the palm nut cake on the fat content, the increase in fat content in the case of cows of the "Wesermarsh" and East Frisian breeds (both heavy milkers) being 0·34 per cent., or 2·19 oz. to 2·26 oz. per cow per day.

The amount of palm nut cake and meal fed per cow per day was large (5½ lb.), and it is doubtful whether smaller quantities would have had any appreciable effect on the fat content. The foodstuffs produced on the farm are generally rich in carbohydrates and poor in albumen, and this is also true of palm nut cake, so that it would only be profitable to feed this cake when it is necessary to buy foods containing a large percentage of carbohydrates, or when it is a question of feeding the animals with concentrated foods.

WEEDS, AND INSECT AND FUNGUS PESTS.

The Weed Flora of Arable Land (*Roy. Agric. Coll., Cirencester, Scientific Bulletin, No. 2, 1910*).—In 1910 the seasonal changes in the weeds of arable land on the College farm were examined, and this report deals principally with the observations made on one field. The surface soil of the field is a calcareous clay, with hardly any siliceous sand separable by washing. The subsoil is a mechanical mixture of stiff yellow clay, with limestone rubble resting on forest marble. It had been sown down to wheat in the autumn of 1909, and the weeds present were tabulated on March 30th, June 8th, July 7th, and October 30th, 1910. A frame a foot square was used, and the weeds enclosed by it counted at a number of places uniformly over the field.

On March 30th it was found possible to count not only the number of species, but also the number of individuals of each species. There were 17 species in all. Small seedlings of the ivy-leaved speedwell (*Veronica hederæfolia*) were the most numerous, being 75 per cent. of the total number of plants. Chickweed (*Stellaria media*) was only moderately abundant (12 per cent.), and fumitory (*Fumaria officinalis*) reached 3 per cent. The rest were sparse. Other fields also showed a considerable dominance of the ivy-leaved speedwell, but fumitory was commoner, especially in fields with a thinner soil. As regards the total number of weed seedlings present, the average per acre varied in the different fields under wheat that were examined from thirty-two to fifty-two thousand.

taken of the number of plants of the species. The same three weeds were the most abundant as in March, but fumitory had greatly increased. The creeping thistle had also much increased, and the convolvulus, not noticeable in March, now took fifth place in abundance. The later germinating annuals, black bindweed and knotweed, especially the former, were very apparent; *Poa annua* had also much increased.

On July 8th the corn crop made it impossible to use the frame, and the foot square area had to be judged by the eye. The shading effect of the corn had then become very noticeable, the most abundant weeds being the climbers, which were numerically in advance of chickweed, speedwells, fumitory and others. Fool's parsley, apparently a late germinating annual, took a prominent place.

In October the flora was practically a repetition of that of the spring.

A Disease of Broad Beans (*Jour. Bath and West and Southern Counties Soc., Fifth Series, Vol.* 5, 1910-11).—The Society's Consulting Botanist, Mr. J. H. Priestley, is investigating the rust of broad beans, (*Uromyces fabae*) which has been prevalent in the West of England. This first attacks the leaves and haulms, upon which it appears as rusty spots, and the spores rapidly spread to the rest of the field. The fungus parasite is still under observation in the laboratory, but the following facts with regard to it are indicated as being the most important from the practical point of view :—

1. Infection from year to year takes place from the diseased spots on the old haulms stored in the rick, so that, if the disease is noted one year, all possible care should be taken to diminish the danger of infection from this source.

2. The disease is seldom dangerous unless it attacks the beans at a very early stage, and in parts of Worcestershire where the trouble used to be serious, it has been almost completely avoided by sowing winter beans. Where this disease has done damage during 1910, early sowing is strongly recommended for later years.

Finger and Toe Disease (*Jour. Land Agents' Soc., May,* 1911, *Vol. x.*).—Mr. Walter E. Collinge, in this article, describes some experiments with lime, followed by a dressing of sulphur, which he has found to be an improvement on the usual dressing of lime alone for finger and toe.

A field known to be very badly attacked was treated in the autumn of 1909 with a dressing of 15 cwt. of ground unslaked lime. It was put on with a manure distributor, and ploughed in. In the spring the same land was given a dressing of flowers of sulphur, 5 cwt. to the acre. An excellent crop of swedes was lifted the following autumn, and the roots were practically free from disease. On only one corner of the field was any disease noticeable, and this very small.

On this small patch there was a considerable amount of heavy clay, which was in a very wet and sticky condition, and quite apart fro the fungus disease, badly required liming. A part of this, abo one-sixth of an acre in extent, was again treated with ground unslak lime at the rate of 12 cwt. to the acre in the autumn, followed in t spring with sulphur as previously. When the swedes were lifted in t

From these and smaller plot experiments, Mr. Collinge concludes:

(i.) That ground unslaked lime is better, where finger and toe disease is present, than ordinary slaked lime, and that this alone gives a reasonable amount of success.

(ii.) If sulphuring the land follows the liming, the results are considerably better.

(iii.) That if the two treatments are applied we have an antidote for this disease, which, at the same time, greatly benefits the soil.

OFFICIAL NOTICES AND CIRCULARS.

Agriculture and Soils of Kent, Surrey, and Sussex.

A Report on the Agriculture and Soils of Kent, Surrey, and Sussex, by Messrs. A. D. Hall, M.A., F.R.S., and E. J. Russell, D.Sc., has been recently published by the Board. The survey of the agriculture and soils of the three south-eastern counties was begun by Mr. Hall in 1899, and was originally intended to relate only to the soils of Kent and Surrey. In 1907, however, on the removal of Dr. Russell from Wye to the Rothamsted Experimental Station, it was decided to add Sussex to the area under investigation, and to include a general account of the agriculture of this well-defined natural district. The earlier analyses of the samples of soils which were made at Wye Agricultural College, were repeated later at Rothamsted, in order to bring them into line with the later analyses made at Rothamsted. The account of the agriculture of the three counties is based partly upon the personal experience of the authors and partly upon information obtained from circulars of enquiry addressed to farmers in the district regarding rotations, varieties of crops, woodlands, &c.

Beginning with a review of the natural features of the district, the report includes an account of the crops, forestry, and live stock of the three counties, traces the relationship of the soils to the crops, and concludes with a description of the soils with tables of analyses. The report is well illustrated, and is accompanied by maps showing the geological formation, rainfall, and the distribution of various crops. It may be obtained at the office of the Board, 4, Whitehall Place, London, S.W., price 2*s.* 6*d.*, post free, bound in green cloth.

Prevalence of Yellow Rattle.

The Board of Agriculture and Fisheries have received information that the weed known as Yellow Rattle, Rattles, Rattlegrass, Cock's-comb, and Horse-penny, is very abundant in some districts this season. They desire, therefore, to draw the attention of farmers whose hay crops may be infested by this annual weed to the necessity for early mowing, in order that the plant may be prevented from ripening and scattering its seeds.

The weed, specifically known as *Rhinanthus Crista-galli*, L., is most abundant in poor, worn-out grass fields, and early mowing, followed by manuring in autumn and spring, will do much to clear infested lan

in the *Journal of the Board of Agriculture* for May, 1908, copies of which may be obtained on application to the Board, price 4d., post free.

Report of the Commercial Control Branch.

The Report (Part I.) of the Intelligence Division of the Board describes the work dealt with in the Commercial Control Branch during the year 1910. This Branch undertakes enquiries and correspondence as to the administration of the Sale of Food and Drugs Acts, 1875 to 1907; complaints relating to adulteration of articles of food affecting the interests of agriculture; the administration of the Fertilisers and Feeding Stuffs Act, 1906; prosecutions under the Merchandise Marks Acts, 1887 to 1894, and Section 1 (8) of the Board of Agriculture and Fisheries Act, 1903; and complaints as to rates and facilities for the carriage of agricultural produce by rail. The appendix contains a Report by the Principal Chemist of the Government Laboratories on the examination of samples of milk taken by an inspector of the Board of Agriculture and Fisheries in connection with an enquiry into methods of sampling milk conducted during June and July, 1910. A summary of this Report was given in the *Journal* for April, p. 30. Information as to the administration of the Fertilisers and Feeding Stuffs Act is also given, including particulars for each county in Great Britain of the arrangements made for sampling by the official samplers, and the fees for analysis payable by the purchaser.

Agricultural Exhibits at the Science Museum.

Among the matters dealt with in the report (Cd. 5625, price 3*d.*) of the Departmental Committee appointed by the Board of Education on the Science and Geological Museums, is the development of the agricultural section of the Science Museum at South Kensington. The existing collection of agricultural implements and machinery, although containing some interesting examples, is recognised as being very fragmentary, and it is in regard to machinery that the Committee recommends the development of the collection. The appendix to the report states that the object of the collection should be to illustrate important inventions or interesting developments, and to provide exhibits useful to students and instructive for the general public, without making a comprehensive display of all the relations of agriculture, *e.g.* space might be found in the proposed new museum for a few important implements in use at the beginning of the seventeenth century and towards the end of the eighteenth century, and there might be as complete a set as possible of models of the chief implements and machines in use at the beginning of the twentieth century. Visitors would then be impressed with the great changes that have taken place in three centuries, even in the simple implements employed in husbandry. Machines quoted as examples are ploughs, harrows, grubbers, cultivators, rollers, drills, artificial manure distributors, steam cultivating machinery, harvesting machinery, threshing machines, dairy i[mple]ments and machinery, and milling machinery.

The Committee does not recommend the inclusion in the agricultural section of objects representing agricultural botany, entomology, and geology, as it is stated that these should be associated with the biological and geological teaching collections to which they are related. It is proposed that the methods adopted for grouping and arranging the objects should be such as to obviate the risk of their presenting no agricultural sequence. Horticulture and forestry would not be included in the collection, as these subjects form part of the museums of the Royal Botanic Gardens, Kew.

County Committees for the Encouragement of the Horse-breeding Industry.

The President of the Board of Agriculture and Fisheries is appointing Committees in each county for the purpose of assisting the Board in all matters pertaining to the encouragement and improvement of the horse-breeding industry. The members of these Committees are nominated by the Chairmen and Conveners of the County Councils, and are gentleman having an intimate acquaintance with the industry of horse-breeding, and with their assistance and co-operation the Board hope to ascertain in the fullest manner all necessary details as to the character and extent of the industry in the localities which they represent.

Lists of the Committees already appointed have been given in the *Journal* for April, May, and June. The two following Committees are additional to those previously given :—

Peebles.

W. L. Dickson, Drumelzier Haugh, Broughton.
H. B. Marshall, Rachan, Broughton.
Robert Watson, Edderston, Peebles.
Secretary, J. Ramsay Smith, Peebles.

Kinross.

Alex. P. Haig, Blairhill, Rumbling Bridge, Stirling.
H. P. R. Montgomery, Hattonburn, Milnathort, Kinross-shire.
J. J. Mowbray, Naemoor, Rumbling Bridge, Stirling.
James Simpson, Aberdona, Clackmannan, Clackmannanshire.
Wm. Tod, East Brackly, Kinross.
Secretary, John Albert Marshall, Kinross.

Wigtown.

Archibald Crawford, Boughton Mains, Sorbie.
J. L. Drew, Doonhill, Newton Stewart, N.B.
John McCaig, Belmont, Stranraer.
A. B. Matthews, Newton Stewart, N.B.
Capt. Aymer Maxwell, Monrieth, Whauphill, Wigtown.
F. J. Rankin, Aird Castle, Kennedy.
Secretary, P. J. Adair, North Strand Street, Stranraer.

Outbreaks of Foot-and-mouth Disease.

Foot-and-mouth disease was reported, on July 3rd, to exist at Bland's Farm, Hounslow, Middlesex. The Chief Veterinary Officer and one of the senior veterinary inspectors of the Board at once visited the premises, and found that forty-two swine, out of a total of seventy-six on the farm, were affected with the disease. In addition to the swine there were nineteen cattle on the premises, one of which has been found to be also affected. The infected place has been placed under strict police supervision, and the whole of the animals remaining on the premises have been slaughtered. On July 4th the Board made an Order controlling the movement of cattle, sheep, goats, and swine into, out of, or within a Scheduled District.

A further case was confirmed on July 6th, on premises within a quarter of a mile of the farm on which the original outbreak was detected. One animal, a cow, was found to be affected. The Board ordered the immediate slaughter of this animal, and of the remaining animals—eight cows and one goat—on the same farm.

With a view to relieve, as far as possible, difficulties in connection with the movement of animals direct to slaughter-houses in London, the Board made an Order on July 6th, allowing such movement by railway or by water into London of animals brought from places outside the Scheduled District. The Order came into operation on July 10th.

In the course of the house-to-house veterinary inspection of animals in the Scheduled District, a further case of foot-and-mouth disease was discovered on July 7th, on the premises known as Church Farm, Harlington. One cow was found to be affected, and there were on the same holding nine other cows and seven calves, which had been in contact with the affected cow.

The Board have reason to believe that infection in this case was carried by mediate contagion from Bland's Farm, and they have accordingly directed the immediate slaughter, with compensation, of the above-mentioned animals on Church Farm.

On July 10th the Board made an Order further modifying the restrictions on the movement of animals in the Scheduled District so as to afford certain facilities for movement for slaughter and for feeding or other special purposes. This Order came into operation on July 12th.

The Board have been informed by the Department of Agriculture and Technical Instruction for Ireland, Dublin, that the Department have suspended, for the present, all importations from Great Britain of cattle, sheep, goats, and other ruminating animals, and swine.

MISCELLANEOUS NOTES.

Importation Regulations.

Importation of Plants into Canada.—Revised regulations, dated February 27th, 1911, and published in the *Canada Gazette* of March 11th, 1911, have been issued under the Destructive Insect and Pest Act (Canada). The following is a summary of the regulations in so far as they relate to stock originating in this country.

Nursery stock, including all trees, shrubs, plants, vines, and

scions, cuttings, and buds are to be imported only through certain ports at stated periods, viz. :—Through Halifax, Sherbrooke, and Montreal, from September 15th to May 15th; through Vancouver, from October 1st to May 1st; through Niagara Falls, from October 1st to May 15th; through Winnipeg and St. John, from March 15th to May 15th, and from October 7th to December 7th; through Windsor and St. Johns (Quebec), from March 15th to May 15th, and from September 26th to December 7th.

The port through which the stock is to enter must be clearly stated on the package. Importers must give notice to the Dominion Entomologist, Experimental Farm, Ottawa, within five days from the date of ordering the stock, and transportation companies or other persons bringing the stock into Canada must give similar notice immediately the consignment is received by them. This notice must include the name of the consignor and the consignee, the points of origin and destination, the name of the company carrying the nursery stock, as well as the nature, quantity, and origin of the same.

Nursery stock or other vegetable matter (coming from Europe) is exempt from fumigation, but is to be inspected either at the port of entry or at its destination. If it is found to be infected with any of the following diseases it will be destroyed, together with the cases, &c., compensation being allowed up to two-thirds of the value of the stock :—San José Scale (*Aspidiotus perniciosus*), Brown-Tail Moth (*Euproctis chrysorrhœa*), Woolly Aphis (*Schizoneura lanigera*), West Indian Peach Scale (*Aulacaspis pentagona*), Gypsy Moth (*Porthetria dispar*), Potato Canker (*Chrysophlyctis endobiotica*), parasitic diseases affecting potatoes externally or internally, Branch or Stem Canker (*Nectria ditissima*), Gooseberry Mildew (*Sphœrotheca mors-uvæ*), White Pine Blister Rust (*Peridermium strobi*).

The above regulations do not apply to the following plants, which may be imported through any port at any period and without inspection :—

(*a*) Greenhouse-grown plants, including roses in foliage, which have been grown in pots up to three inches in diameter, but not larger. A certificate that the plants have been grown under glass must accompany the invoice, and is to be signed by the consignor.

(*b*) Herbaceous perennials (the stems of which die down in winter), such as perennial phlox, peonies, sunflowers, &c.

(*c*) Herbaceous bedding plants, such as geraniums, verbenas, pansies, &c.

(*d*) Bulbs and tubers, such as hyacinths, lilies, narcissi, and other true bulbs, and also the tubers of dahlias, irises, &c.

Importation of Plants into Sweden.—Regulations of September 22nd, 1905, prohibit the importation into Sweden of gooseberry bushes and fresh gooseberries. Regulations of September 14th, 1906, provide that living plants imported into Sweden shall be accompanied by an invoice and certificate duly signed by the public authority of the place of portation, to the effect that the consignment does not contain gooseerry plants or fresh gooseberries. Failing this, the consignment ust be submitted by the importer to the Customs authority for examinan. The certificate above referred to must be legalised by the Swedish nsul or Vice-Consul if such is stationed at the port of embarkation; but

nothing in the regulations is to prevent the Customs authority from handing over the consignment to the persons concerned, even if such certificate or invoice is wanting, if, after the ordinary Customs examination, the authority is satisfied that the consignment does not contain gooseberry plants or fresh gooseberries.

Importation of Animals and Animal Products into Hungary.—Regulations regarding the importation into, and transit through, Hungary of animals and animal products were issued by the Hungarian Minister of Agriculture on April 22nd, 1910, and came into force on May 1st, 1910.

Dogs, cats, hares, cage-birds, bees, and fish are not subject to any restrictions from a sanitary point of view.

Live and dead poultry, solipedes (horses, asses, and mules), fresh undried skins and furs, raw undried parts of animals, and other raw animal products originating in Europe, are inspected on entry into the country, and must be accompanied by the certificate of a State veterinary surgeon in the country of origin to the effect that the stock is healthy, or, in the case of dead poultry, that the birds were healthy before being killed, or, in the case of animal products, that they are from healthy animals; and the certificate must state in the case of poultry that no infectious animal disease has existed in the district of origin for 40 days prior to dispatch, or, in the case of solipedes, that no infectious disease which may be communicated to draft animals has similarly existed, or, in the case of animal products, that they are from a district free from disease. The certificate accompanying fresh undried skins and furs and raw undried parts of animals, if not issued by a State veterinary surgeon, or by the Austro-Hungarian Consulate, must be verified by the Consulate. If, however, certain animal products are sent without such a certificate their importation can only be refused if there are serious sanitary reasons to justify this course. In the case of solipedes a separate certificate is required for each animal.

The certificates of origin and health should, in addition to the above, contain the following particulars:—The country, district, and village whence the goods originate, the number and species of the animals, the kind, quality, and the number and total weight of the raw animal products, the place of despatch and destination of the goods, and the names of sender and addressee. The certificate should, if not written in the official language of the country of destination, be furnished with verified translation. Those relating to consignments to be transported through Hungary, which enter the frontier of Hungary, should, if not written in Hungarian, be furnished with verified Hungarian translation.

Cloven-footed animals and fresh and prepared meat can only be imported into or transported through Hungary with the previous special permission of the Minister of Agriculture, to be issued in each case, and with the conditions stipulated in the permission.

All the above animals and animal products can only be imported at certain stations designated for that purpose at the frontier of the Austro-Hungarian Customs territory. Consignments which on inspection have been found unhealthy or are suspected of some infectious disease, or which do not answer to the other conditions prescribed, are refused admission into the country. If poultry are found to be diseased the

birds are destroyed, and no compensation is paid to the owner. The transport of live poultry on railways can only be effected in railway carriages or in coops, closed with leaden seals, so constructed that the litter, food, and droppings cannot fall out.

Demand for Agricultural Machinery Abroad.

Agricultural Machinery in France.—H.M. Consul at Bordeaux, in *reporting on the trade* of that district in 1910 (*F.O. Reports, Annual Series, No.* 4,659), states that the shortage of crops in 1910 influenced the retail trade in agricultural implements in general, and left stocks on dealers' hands, with the result that fewer orders, particularly for harvesting machines, will be given in 1911. The American International Harvester Company, who have built works at Croix, near Lille, are turning out mowers and reapers of the same models and names as those previously imported. When in full working order they will be in a position to turn out annually some 20,000 mowers of their different types, on which they will save about 25 per cent. on the selling price in freight, duty, and other expenses. The British steam threshing machinery trade must also expect to suffer in future from competition at the hands of the Vierzon manufacturers, who are turning out good, light machines at very low prices.

Agricultural Machinery in Turkey.—According to the *Handelsmuseum* (Vienna) of May 18th, the Austrian Consul in Smyrna reports that there are exceptionally good openings for agricultural machinery in the interior of Asia Minor, particularly in the vilayet of Konia. A German agricultural machinery depôt which was established a short time ago in Konia has been a great success. The farmers of Anatolia were particularly impressed by the fact that, although there was an excellent harvest in 1910, a large portion of the crops was wasted owing to scarcity of labour and of labour-saving implements. Further, irrigation schemes are being proceeded with, the object being to bring more *land under cultivation, so that there is every prospect of a good trade* in agricultural implements during the next few years. Manufacturers would be well advised, says the Austrian Consul, to combine for the purpose of sending an experienced traveller to the above-mentioned districts, in order to become fully acquainted with the conditions of the market. (*Board of Trade Journal*, May 25th, 1911.)

Agricultural Machinery in Siam.—A report on the exhibition which was held at Bangkok in April last (see *Journal, January*, 1911, p. 860) has been received from the Acting-Consul at that town (Mr. J. Crosby).

It appears that the feature of the agricultural machinery section was an extensive display of ploughs, so arranged as to contrast the native wooden article with light steel ploughs from Europe or America. Ploughing trials conducted on the experimental farm organised near the exhibition grounds demonstrated the great superiority of the latter type of implement over the native one. The steel ploughs are suitable for traction by one or two buffaloes, and they are said to weigh only *a few pounds more than the wooden plough of the country*, whilst their average price is no higher. H.M. Vice-Consul is of opinion that these ploughs should find a good market in Bangkok, and states that the Siamese Ministry of Agriculture is endeavouring to encourage their

use. Medals were awarded to German firms for these ploughs, as well as for threshing-machines and agricultural locomobiles.

Opening for Agricultural Machinery in Western Canada.—H.M. Trade Commissioner for Canada (Mr. R. Grigg) reports that the agent in Vancouver of a farmers' association of Western Canada desires to get into touch with British manufacturers of the following agricultural machinery and implements, viz.:—Self-binders, ploughs, farming traction engines, harrows, binder twine, butter-making machinery, wire fencing, windmills, farm waggons, hoes, drills, horse rakes, mowers and reapers, drag rakes, packers.

The name of the association may be obtained by British agricultural machinery makers on application to the Commercial Intelligence Branch of the Board of Trade, 73 Basinghall Street, London, E.C. For further information, inquiry may be made of the Imperial Trade Correspondent, Mr. P. G. Shallcross, c/o Messrs. Shallcross, Macaulay and Co., 144 Water Street, Vancouver. (*Board of Trade Journal*, June 8th, 1911.)

Agricultural Exhibitions Abroad.

Exhibition at Rostov-on-Don.—H.M. Vice-Consul at Rostov-on-Don reports that the agricultural exhibition at that town will this year be held from September 23rd to October 14th. A horse show will be held from September 25th to October 3rd, and a cattle and poultry show from October 4th to October 14th. About £1,200 will be distributed as money prizes during the exhibition.

Notes on the Weather in June.

The weather conditions deteriorated throughout June, the month commencing in general with very unusual warmth, very abundant sunshine, and light rainfall, and ending with deficient warmth, scanty sunshine, and variable rainfall.

During the *first* week (May 28th to June 3rd) the general condition was very fine and bright, but after the early days of the week thunderstorms occurred in all parts of Great Britain. Warmth was everywhere "very unusual," the mean values for the week being in most cases higher than any recorded in the corresponding week during the past thirty years. Rainfall was "light" or "very light," except in England E., where it was "moderate." Sunshine was everywhere "very abundant."

The general conditions continued dry and fine into the *second* week. Warmth was again "unusual" or "very unusual," and rainfall was either "light" or "very light." Bright sunshine was above the normal in all districts, the excess being large, except in Scotland N.

The *third* week witnessed a change in the weather, and by the end of the week unsettled conditions extended over the entire country. Temperature was "deficient" in all districts, and "very deficient" in Scotland E. Rainfall was deficient over the east of Great Britain, slightly in excess of the average in England N.E., and rather more than the normal amount in the western and south-western districts. Bright sunshine was either "moderate" or "abundant."

fairly long intervals of bright sunshine. Warmth was generally classed as "moderate," but was "unusual" in England E. and N.E. Rainfall was "heavy" or "very heavy," amounts ranging between 1 in. and 1½ in. being recorded on the 23rd at most places in the eastern half of England, still larger quantities falling on the 24th in the north of England and east of Scotland. Bright sunshine was usually "scanty."

Unsettled conditions continued into the *fifth* week. Temperature was below the normal, being classed everywhere as "deficient" or "very deficient." Rainfall was variable, the falls being "heavy" in Scotland N. and England E., and "moderate" elsewhere. Sunshine was "scanty" or "very scanty."

Notes on Crop Prospects Abroad.

The International Institute of Agriculture, in its Bulletin of Agricultural Statistics for June, 1911, gives the following particulars with regard to the condition of winter-sown cereals on June 1st, 1911, compared with the condition on the corresponding date in 1910:—

Country.	Winter Wheat.		Winter Rye.		Winter Barley.		Winter Oats.	
	June 1st, 1911.	June 1st, 1910.	June 1st, 1911.	June 1st, 1910.	June 1st, 1911.	June 1st, 1910.	June 1st, 1911.	June 1st, 1910.
Belgium . .	105	—	108	—	105	—	—	—
Denmark . .	103	101	105	98	—	—	—	—
Luxemburg .	102	98	105	87	102	106	102	—
Norway . .	—	—	95	—	—	—	—	—
Roumania . .	115	145	115	145	115	155	—	—
Switzerland .	100·3	103	98·3	101	104·6	102	—	—
United States.	98·5	97·7	98·2	100·8	—	—	—	—
Japan . . .	105	—	—	—	110	—	—	—
Tunis . . .	120	105	—	—	110	100	115	120
Lower Egypt .	127	—	—	—	—	—	—	—
Upper Egypt .	117	—	—	—	—	—	—	—

(100 = average yield.)

The condition of spring cereals on June 1st, 1911, compared with the condition on the corresponding date in 1910 is given as follows:—

Country.	Spring Wheat.		Spring Rye.		Spring Barley.		Spring Oats.	
	June 1st, 1911.	June 1st, 1910.	June 1st, 1911.	June 1st, 1910.	June 1st, 1911.	June 1st, 1910.	June 1st, 1911.	June 1st, 1910.
Belgium . .	105	—	—	—	105	—	105	—
Denmark . .	—	—	—	—	99	102	102	102
Luxemburg .	105	99	210	96	110	100	101	97
Roumania . .	—	—	—	—	115	150	115	120
Switzerland .	101·75	100	—	100	100·4	102·5	99·3	102
United States.	101·1	99·8	—	[illegible]	99·2	99	96·9	102·9
Japan . . .	84	—	—	—	123	—	99	—
Lower Egypt .	—	—	—	—	120	—	—	—

The condition of the crops in Belgium, Denmark, Spain, Ireland, Luxemburg, Norway, and Roumania appears from the reports given to be generally good.

Russia.—The rain which fell at the end of April and the beginning of May (o. s.) in certain parts of the country made a great improvement in the condition of the winter cereals in comparison with their condition in the beginning of spring. The hot weather then set in, and on May 10th (o. s.) the condition of the winter cereals could be considered as satisfactory on the whole, although it was not possible to ascertain exactly the extent of the damage caused by the cold and drought in the winter and in the beginning of spring. It may be said, however, that the regions which have been most seriously tried are the north-west, the extreme south-west, and the northern Caucasus; in the two latter places, the wheat is not in as good a condition as the rye.

The area sown to cereals has not decreased except in the regions mentioned above, the damaged crops of winter cereals having been replaced by spring cereals. The spring sowings have been made much later than usual everywhere, on account of the cold weather in April. In the south it was not possible even to begin them before the beginning of April (o. s.). The germination was very uniform, but the growth was arrested later on by the return of the cold and drought.

Switzerland.—The probable yield of cereals is estimated as follows:—Wheat, 1,877,000 cwt.; rye, 905,000 cwt.; barley, 199,000 cwt.; and oats, 1,433,000 cwt. The weather conditions are favourable to the crops. There are no diseases, with the exception of a little rust.

Canada.—The table given below indicates the condition of the wheat, rye, barley, and oat crops on June 1st, 1911, expressed in the percentage of a "standard" condition of the cereals on June 1st of the past year:—

	June 1st, 1911.	June 1st, 1910.
Winter wheat	80·63 ...	87·65
Spring wheat	96·69 ...	91·49
Rye	90·26 ...	88·12
Barley	93·49 ...	92·94
Oats	94·76 ...	93·95

The season is favourable to the crops in all parts of the country, and they are growing well.

Japan.—The probable yield of cereals is estimated as follows:—Wheat, 11,569,000 cwt.; barley, 40,499,000 cwt.; and oats, 1,307,000 cwt.

Tunis.—The condition of the wheat, oats, and maize crops is excellent. The rains were abundant and well distributed during the spring. The wheat crop is estimated at 4,133,000 cwt., as compared with 2,165,000 cwt. in 1910.

Chile.—The preparatory work and the sowing of autumn cereals are being carried out under average conditions. The weather conditions are favourable, although the sowing is being done at rather a late date.

Australia.—The preparatory work and the sowing of autumn cereals are being carried out under average conditions. The weather condi-

cereals for wheat, barley, and oats are being effected under average conditions. The period is quite normal and the weather conditions are favourable.

India.—The final general memorandum on the wheat crop of the season 1910–11 gives the total area under the crop as 29,554,500 acres, or 5·5 per cent. above the revised figure for 1909–10, and 9 per cent. above the average of the preceding five years. The total outturn in 1910–11 is estimated at 9,900,800 tons, as against 9,590,600 tons in 1909–10, and an average of 7,868,200 tons during the preceding five years. The wheat crop of 1910–11 is thus the largest on record. (*Indian Trade Journal,* June 1st, 1911.)

United States.—H.M. Consul at Chicago states that according to the United States Government report the total yield of spring wheat on June 1st was estimated at 284,000,000 bushels, as compared with a final yield of 231,000,000 bushels in 1910. The estimated winter wheat crop was 480,000,000 bushels, as compared with a final yield in 1910 of 464,000,000 bushels. The total wheat crop estimate on June 1st was thus 764,000,000 bushels, as against 695,000,000 bushels in 1910, being the largest yet recorded.

According to *Dornbusch* of July 10th, 1911, the United States Department of Agriculture estimates the condition of winter wheat on July 1st at 76·8, compared with 81·5 on July 1st, 1910, and a ten-year average of 81·4. The condition of spring wheat is estimated at 73·8 on July 1st, compared with 61·6 on July 1st, 1910, and a ten-year average of 87·8. Oats and barley are put at 68·8 and 72·1 respectively, as against 82·2 and 73·7 last year, and a ten-year average of 86·3 and 87·9.

Hungary.—On June 27th the Ministry of Agriculture estimated the area under wheat and rye to be below, and that of barley and oats to be slightly above, the area harvested in 1910. The wheat and rye crops were estimated at 87,223,000 cwt. and 24,836,000 cwt., compared with 90,886,000 cwt. and 26,161,000 cwt. in 1910. The development of barley and oats is very favourable, and potatoes promise well, the earlier sorts being already harvested.

Austria.—The Ministry of Agriculture gives the condition of crops in the middle of June as follows:—Wheat, 2·5; rye, 2·7; barley, 2·4; oats, 2·5; maize, 2·6; and potatoes, 2·3 (2=above average, 3=average). Wheat and rye were not in so good a condition as on the same date in 1910, while barley and oats were better than last year. Wheat, although developing well, has in general suffered badly from rust. Potatoes in general were healthy, and where planted early were already in blossom.

Sugar-Beet in Russia.—A dispatch from H.M. Ambassador at St. Petersburg, dated June 1st, reports that the area under sugar-beet is estimated on the authority of sugar factories interested at 1,943,000 acres, which represents an increase of 271,000 acres, or 16·4 per cent. over last year's area. In view, however, of the lateness of spring this year, field operations have been much retarded, and on May 3rd

therefore, that the area actually sown this year will prove eventually to be considerably smaller than that estimated by the sugar factories.

Norway.—H.M. Consul at Christiania (Mr. E. Gray), in a dispatch dated June 19th, states that according to the report of the *Morgenbladet* it is already certain that the hay crop of Norway, which is by far the most important crop on farms in that country, will be a poor one, as the grass has been so much forced by the unusual early heat that it has ceased growing under the prolonged drought. Corn and meadow lands are greatly retarded by the continuation of the severe drought and by the recent change from extremely hot to very cold weather; the corn crops may, however, yet be saved by a timely rainfall.

France.—The report of the Ministry of Agriculture gives the condition of potatoes on June 1st as good to very good in forty-seven departments, above average to good in thirty-two departments, and average in one department. On the whole the condition of the crop is much better than at the same time last year, when a good to very good condition was reported from twenty-five departments, an above average to good condition from fifty departments, and an average condition from four departments. (*Journal Officiel,* June 25th, 1911.)

With regard to wheat, the general aspect on June 8th was satisfactory; the area under this crop is about 96 per cent. of the area of 1910. (*Bulletin of Agricultural Statistics, Supplement,* June 30th, 1911.)

Holland.—The British Consul at Rotterdam, in a report on the prospects of fruit and vegetable crops in Holland as on June 1st, states that the continued drought will, it is feared, adversely affect all kinds of garden produce, particularly strawberries. Gooseberries have been damaged by the frost, but apples and cherries are expected to be a good crop. Pears will be scarce, owing to the drought and damage from insects, and only a moderate crop of raspberries and plums is expected. The prospects of vegetable crops generally are good.

Th· *Bulletin of Agricultural Statistics, Supplement,* June 30th, 1911, gives the condition of cereals on June 15th as follows:—Wheat, 111; rye, 114; barley, 109; oats, 94 (100=average).

Canada.—The condition of wheat and oats on June 1st was on the whole a little better than that of last year at the same period. The area cultivated is 113 per cent. in the case of wheat, and 104 per cent. in the case of oats of last year's area. The condition of barley and rye on June 1st was rather better than last year at that date. The area is slightly less than in 1910. (*Bulletin of Agricultural Statistics, Supplement,* June 30th, 1911.)

Argentina.—The preparatory work and the sowing of cereals is being effected under good conditions. The sowing period is normal and the weather conditions are favourable. (*Bulletin of Agricultural Statistics, Supplement,* June 30th, 1911.)

Bosnian Plum Crop.—H.M. Consul at Sarajevo reports that according to the *Bosniche Post* of June 26th, the prospects of the plum crop of Bosnia are not very good. The total crop is estimated at between 1,000 and 1,200 waggon loads of dried plums, appearances pointing to the fruit being large. Prices are expected to be proportionately

Crop Conditions on July 1st.

The Crop Reporters of the Board, in reporting on agricultural conditions on July 1st, generally comment upon the adverse effect of the continued spell of hot, dry weather upon the crops, and their improvement after the rain. Wheat stood the prolonged dry period better than barley or oats, and promises to be the best of the cereal crops. It improved during the month, and is now reported as for the most part strong and healthy, and coming into ear well. In some districts the straw is short, but it has made some growth with the recent rains. The yield on the whole is expected slightly to exceed the average, the best results being looked for in the northern division. Both barley and oats have suffered from the want of moisture, but have improved since the rains. The plant is thin and patchy in places, and generally short in the straw, and a yield below average is anticipated for both crops, oats being the least satisfactory of the three cereals. Beans have been considerably affected by "fly," and are short in the haulm. The yield is not expected quite to reach an average. Peas vary considerably, and reports state that the early varieties are yielding lightly, and for the main crop a yield slightly below average may be looked for.

Potatoes have generally done well, though some areas have been affected by frosts during the month. The plant is vigorous and healthy, and has been greatly improved by the recent rains; a slightly over-average yield is predicted. Early varieties are reported to have yielded light crops in some districts.

Roots suffered from the drought, and mangolds are thin in plant, and, although considerable improvement is recorded during the latter part of the month, they are generally backward. The yield is not expected to reach an average. Early sown turnips and swedes have suffered badly from the dry weather and "fly," and a large area has had to be re-sown. The later sown turnips were got in under more favourable conditions, and are a fair plant.

The spell of dry weather has changed the prospects for the hay crop, which at the date of the last report was expected to exceed average, while the results now are anticipated to be considerably below average. Considerable progress has been made with the cutting of "seeds" hay, much of which has been secured in good condition. Rain, however, interrupted the work, and little meadow hay has yet been mown. The yield of both kinds is expected to be under average, with better results from arable land than from meadows.

Cold nights during June checked the growth of hops, attacks of vermin have been very prevalent in the south-eastern division, and washing has been necessary; in most districts an average yield is anticipated. In the west midland division blight has been troublesome in Worcester, though in Hereford it is not now so severe. The crop is not promising in this division on the whole.

Fruit crops were extensively attacked by insects during the hot, dry weather, and from the same cause much tree fruit prematurely dropped. The crop of strawberries and raspberries is slightly over average, apples about average, and currants, gooseberries, plums, pears, and cherries under average.

The bareness of the pasture during the early part of the month affected the condition of the stock in some districts, but with the recent

rains the growth of grass was started, and cattle and sheep are now on the whole progressing favourably.

Summarising the reports and representing an average crop by 100, the appearance of the crops on July 1st indicates yields for Great Britain which may be represented by the following percentages:—Wheat, 101; barley, 97; oats, 94; beans, 99; peas, 99; potatoes, 102; mangold, 99; "seeds" hay, 94; meadow hay, 90; hops, 98.

Prevalence of Animal Diseases on the Continent.

The following statement shows that, according to the information in the possession of the Board on July 1st, 1911, certain diseases of animals existed in the countries specified:—

Austria (week ending June 14th).

Blackleg, Swine Erysipelas, Foot and Mouth Disease (3,482 Höfe).

Belgium (fifteen days ending May 15th).

Anthrax, Blackleg, Rabies.

Bulgaria (nine days ending June 14th).

Blackleg, Glanders and Farcy, Rabies, Sheep-pox, Sheep-scab, Swine-fever.

Denmark (month of May).

Anthrax, Foot-rot, Glanders and Farcy, Swine Erysipelas, Foot and Mouth Disease (one case).

France (Month of May).

Anthrax, Blackleg, Glanders and Farcy, Rabies, Sheep-pox, Sheep-scab, Swine Erysipelas, Swine-fever.

Foot and Mouth Disease (462 "étables" in 188 "communes").

Germany (on June 15th).

Glanders and Farcy, Swine-fever, Foot and Mouth Disease (16,504 infected places in 3,271 parishes).

Holland (month of May).

Anthrax, Foot-rot, Swine Erysipelas, Foot and Mouth Disease (4,602 outbreaks in 7 provinces).

Hungary (on May 31st).

Anthrax, Rabies, Sheep-pox, Swine Erysipelas, Swine-fever, Foot and Mouth Disease (2,732 "cours").

Italy (week ending April 30th).

Anthrax, Blackleg, Glanders and Farcy, Rabies, Sheep-scab, Swine Erysipelas, Swine-fever, Foot and Mouth Disease (576 cases entailing 25,004 animals).

Montenegro (sixteen days ending April 15th).

Foot and Mouth Disease (54 provinces infected entailing 484 animals).

Norway (month of May).

Anthrax, Blackleg, Swine-fever.

Roumania (ten days ending June 13th).

Anthrax, Dourine, Glanders and Farcy, Pleuro-pneumonia, Rabies, Sheep-pox, Swine Erysipelas.

Servia (eight days ending June 10th).
Anthrax, Rabies, Sheep-pox, Swine-fever, Foot and Mouth Disease (12 cases in 1 "commune").

Spain (month of April).
Anthrax, Blackleg, Dourine, Rabies, Sheep-pox, Sheep-scab, Swine Erysipelas, Tuberculosis.

Sweden (Month of May).
Anthrax, Blackleg.

Switzerland (week ending June 25th).
Anthrax, Blackleg, Swine Erysipelas, Foot and Mouth Disease (47 "étables" entailing 363 animals, of which 15 "étables" were declared during the week).

Agricultural Labour in England during June.

The Board of Agriculture and Fisheries have been furnished by the Board of Trade with the following report, based on returns from correspondents in various districts, on the demand for agricultural labour in June:—

Employment was generally regular, except in the case of some men outside the regular farm staff, who lost a little time through the interruption of haymaking by rain during the last week of June. In many districts the demand for extra labourers was adversely affected by the dry weather which prevailed until the latter part of the month. There was, however, some scarcity of such men in several districts.

Northern Counties.—Employment was generally regular in these counties, but the demand for extra labourers was affected for the greater part of the month by the prolonged dry weather, which rendered the root crops backward, and reduced the amount of hoeing to be done. Correspondents reported a slight upward movement in wages at the Whitsuntide hiring fairs in Cumberland, Westmorland, and Lancashire, particularly in the case of women and girls, who were generally scarce.

Midland Counties.—Employment was somewhat affected by the dry weather, as in the Northern Counties, but improved towards the end of the month as haymaking became more general. There was not generally any marked surplus in the supply of extra labourers, though some excess over the demand was reported in several districts, including parts of the Bakewell (*Derbyshire*), Cannock, Stone, and Tamworth (*Staffordshire*), Woodstock (*Oxfordshire*), and Eaton Socon (*Bedfordshire*) Rural Districts.

Eastern Counties.—There was generally a good demand for extra labourers in these counties for hoeing and haymaking, and, apart from slight interruptions to haymaking caused by rain, there was but little irregularity of employment among men of this class. Some shortage of extra men was reported in several districts, including parts of the Chesterton, Melbourn and Wisbech (*Cambridgeshire*), Welton (*Lincolnshire*), Forehoe (*Norfolk*), and Plomesgate (*Suffolk*) Rural Districts.

Southern and South-Western Counties.—Extra labourers were in fairly good demand for hoeing and haymaking. Rain caused a little

dry weather on the root crops, but mention of a surplus in the supply of men was exceptional in the reports. On the other hand, some scarcity of men was reported in several districts, including parts of the Bridge (*Kent*), Godstone, Epsom and Farnham (*Surrey*), Andover (*Hampshire*), Chipping Sodbury and Dursley (*Gloucestershire*), and Bodmin and West Penwith (*Cornwall*) Rural Districts.

THE CORN MARKETS IN JUNE.

C. KAINS-JACKSON.

There cannot be much doubt that an important check to trade has been found in buyers' belief that the present season would be not only a good, but an early one. In that event the current cereal year would not afford to holders of old corn their full period for unloading it before the new crops came on the market. Whether this expectation will be realised depends largely on the weather, but it may be remarked that stocks of none of the cereals are excessive, while of wheat they are decidedly below the average. But for the wholly exceptional May and first half of June the markets must admittedly have increased their prices in order to secure adequate supplies to tide over the remaining weeks of the cereal year.

Wheat.—Few price changes occurred during the month, and the sales of English were not large, even when allowance is made for the holiday intervals. The middle of the year is always an interesting point at which to compare values, and on June 30th, 1911, fine English wheat stood at 36*s.*, against 33*s.* a year previously, and other sorts of wheat at the following prices, the mean value on June 30th, 1910, being given in brackets. Best Russian, 36*s.* (33*s.* 6*d.*); No. 1 Northern Manitoba, 37*s.* 6*d.* (35*s.*); No. 4 Manitoba, 34*s.* 9*d.* (32*s.* 6*d.*); new Australian, 36*s.* (33*s.* 6*d.*); Argentine, 35*s.* (32*s.* 6*d.*); and No. 2 white Calcutta, 35*s.* 6*d.* (33*s.*). When considering that the month closed with prices tending to go back a little, we must not forget the 2*s.* to 3*s.* advance achieved. It represents, so to speak, something definite in hand from which, with favourable crop prospects, a little may be "allowed off" and yet leave us fair prices and markets free from depression.

Shipments of the month were 808,000 qr. from North America; 1,403,000 qr. from South America; 2,646,000 qr. from Russia; 264,000 qr. from Europe S.E.; 672,000 qr. from India; and 375,000 qr. from Australasia. These figures show a general *increase as compared with June, 1910, yet supplies on passage* to the United Kingdom on June 30th, 1911, were only 290,000 qr. more than at a like date last year. The Continent must therefore have taken an unusually large quota of the total shipments. Continental purchasing has upheld our markets by its strong if indirect action, and may be expected to do so until the new crops of France, Italy, and Central Europe are actually in stock.

The American harvest of winter wheat was on the whole favourably spoken of, both for quantity and quality. There was, however, no

portation. In Canada, Winnipeg's price of 30*s.* 6*d.* for October delivery of new crop, against 32*s.* 9*d.* for July delivery of old, witnessed to the trade view of harvest prospects being decidedly favourable. The Indian new crop was officially reckoned on the June report as materially above an average, but shipments have not been taking place at any eager rate, and the Indian wheat harvest is being held with considerable confidence in its fetching a very fair price; 35*s.* for white, and 34*s.* for red are about the mean values indicated.

Flour.—A very poor inquiry from bakers has been recorded, and although the fine early summer has been against retail demand for bread, it is currently supposed that holdings at the bakeries are now much reduced, and will require replenishment soon. The prices ruling at the end of June thus compared with the new year a twelvemonth previously; 1910 prices are given in brackets. Top-price, 31*s.* (30*s.*); Town Whites, 28*s.* 9*d.* (27*s.* 6*d.*); Town Households, 25*s.* 9*d.* (24*s.* 6*d.*); Best Country Patents, 27*s.* 6*d.* (26*s.*); Country Straights, all English, 25*s.* (22*s.* 6*d.*); Minnesota Best, 30*s.* 6*d.* (31*s.* 6*d.*); Minnesota Patents, 26*s.* 6*d.* (28*s.*); Iron Duke, 23*s.* (23*s.*); Kansas Patents, 26*s.* (28*s.*); Australian, 26*s.* (26*s.*); and fine Hungarian, 42*s.* (39*s.* 6*d.*). "Standard," not a leading type a year ago, is now quoted 26*s.* to 27*s.* London, 25*s.* to 26*s.* country. American shipments for June were fair, 468,000 sacks, but no other exporting country did much, and on the 30th only 174,000 sacks were on passage from all sources.

Barley.—Russian feeding corn has maintained through June the advance won in May, but India and Persia have done something to relieve the scarcity of this type, and value therefore has not been further enhanced. Malting and brewing sorts have been very scarce, but inquiry also being at a low ebb, no price changes are to be noted. Russia shipped 1,981,000 qr., but of this total Continental purchasers took by far the greater quantity. No other country shipped any important quantities of barley. On the last day of the month there were 300,000 qr. on passage.

Oats.—British oats are again markedly dearer on the month, and the profit realised on holding oats until they are well seasoned is shown season after season. Imported oats are an instructive side-witness to the British position, for despite a 30 per cent. increase of June imports over those of May, the price has rather advanced than receded. Russia in June completely distanced Argentina as a shipper, the totals being respectively 1,061,000 qr. and 348,000 qr. There are now about half a million quarters of foreign oats on passage, but the exhaustion of the home crop is so nearly absolute that so far from this considerable total depressing the markets, the talk thereat is rather as to the earliest date at which the importer can assure delivery. The growing crop in Great Britain was regarded by the exchanges of the 20th and 21st as jeopardised by the drought, but then came the Coronation holidays, which ended in a liberal rainfall, and before trade had been resumed the drought anxiety had been somewhat allayed.

Maize.—Russia and South-Eastern Europe have in no previous year had so good a surplus available for early summer exportation. June shipments of 600,000 qr. from Russia and of 1,028,000 qr. from Europe S.E. have been the [illegible]

nothing, and America only 401,000 qr., so that the round corn o' European growth has completely dominated the market. African maiz of good quality has risen to 29*s.* per qr., but supply is still small. W must hope that in another season our African possessions will be in position to satisfy the taste which they have created. That they ca grow the very maize the British market requires has been proved, and i has sold well in June, even when priced 6*s.* above the 23*s.* level c Russian and American corn. The Burmese offers at five guineas pe ton continue to be taken up, but there is as yet very little Asiatic cor actually on spot.

Oilseeds.—Demand is poor, a circumstance which, with summe setting in early, was only to be expected. Prices have fallen a littl Linseed perhaps may be averaged at 16*s.* 6*d.* per cwt., against 17*s.* 6 a month ago, and cottonseed at 8*s.*, against 8*s.* 4½*d.* per cwt. Th prices asking for oilcake are comparatively moderate, and suggest th desirability of looking ahead to lay in "cake" in summer for the need of the autumn and winter. At the end of June London-made linsee cake was making £7 17*s.* 6*d.* per ton, against £9 2*s.* 6*d.* a year ago London-made cottonseed cake, £4 17*s.* 6*d.*, against £7 a year ago; an East Indian rapeseed cake, £3 16*s.* 3*d.*, against £4 18*s.* 9*d.* a year ag Soy bean cakes at £5 15*s.* per ton may also be noted, and analysts c distinction affirm them to be of excellent feeding and fattening value.

Various.—Beet sugar has been a rising market, and thos who sold in December and January at 9*s.* to 9*s.* 1*d.* pe cwt. are seen to have lost heart unduly. Rice for feeding purpose has been steady at 8*s.* per cwt., and a reduction in the supply o passage suggests that the market may go rather higher than lowe A fair to good trade has been doing in Rangoon haricots to arriv in August; for these 7*s.* per cental may be quoted. Other "misce laneous transactions" have included sales of Turkish canaryseed a £2 2*s.* per quarter, of locust beans at £6 per ton, c Sorghum or Argentine millet at 24*s.* per 416 lb., and of good Ne Zealand maple peas at 8*s.* per cental. The last-named find favour wit keepers of poultry and rearers of game birds, but above all with th owners of pigeons.

THE LIVE AND DEAD MEAT TRADE IN JUNE

A. T. MATTHEWS.

Fat Cattle.—Under the adverse influences of hot weather, diminish ing grass keeping and consequent increased supplies, the trade in fa cattle weakened very considerably, and prices fell during the firs three weeks to the extent of over 3*d.* per stone. Refreshing rains, wit lower temperatures and improved prospects for the pastures, caused distinct revival in the last week, the tendency to hurry cattle to mark being checked. Still the general averages for the month show a fa in values for all breeds compared with those of May. Shorthorn averaged 8*s.* 0½*d.*, 7*s.* 4½*d.*, and 6*s.* 4½*d.* per 14 lb. stone in abou twenty English markets for first, second, and third qualities, agains 8*s.* 4½*d.*, 7*s.* 8½*d.*, and 6*s.* 8*d.* in May. Herefords averaged 8*s.* 2½*d.* an

8s. 6d. and 7s. 11½d. per stone. All stock were similarly affected by the alarming continuance of the long spring drought, and there is no doubt that the above decline in cattle may be confidently attributed to that cause. London market formed a singular exception as regards supplies. The number of fat cattle offering at Islington averaged only about 500 weekly, which is little more than half the normal supply. On the last Monday there were only 350 on offer, and this was something like a record for that market. Yet the prices realised were well above the average throughout the month.

Veal Calves.—There was a further fall in the value of fat calves, and the average prices in about twenty-five British markets were 8½d. and 7½d. per lb., or ½d. per lb. less than those of May.

Fat Sheep.—The trade in sheep in June may be described as dull and discouraging. Until the last week the demand was sluggish, and average prices remained at a dead level for all qualities. These were :—Downs, 7d., 6¼d., and 5d. per lb., and Longwools, 6½d., 5¾d., and 4½d., for the three qualities as classified in the returns. In the last week, however, there was a welcome change of tone, and in a large majority of the markets quoted prices advanced ¼d. per lb. At Newcastle, Downs were quoted ¾d. per lb. higher than at the previous market, and at Basingstoke ½d., Dorchester being the only place showing a decline. A glance at the English markets for the last week shows a surprising difference in values at various markets. At Newcastle and Salford Downs were quoted at 8d. per lb., and at London, Bristol, and Derby 7¾d., but at Hereford, Shrewsbury, Wellington, and York the top price was only 6¾d. Prime Cheviots made 8¼d. per lb. in English markets, or about ½d. more than in those of Scotland.

Fat Lambs.—As the season advances fat lambs are more freely marketed, individual weights increase, and therefore lower prices are expected. There has been a very fair demand for good lambs, and the average prices in about forty British markets were 10d. per lb. for first, and 9d. for second quality. This was a fall of 1½d. per lb. on first quality, and 1d. on second, compared with May.

Fat Pigs.—A further fall of about 6d. per stone took place in the average prices of pigs, which in twenty-eight markets were 6s. 5¼d. and 5s. 9½d. per stone for first and second quality.

Carcass Beef—British.—Supplies of Scotch beef were about normal, but towards the end of the month long or whole sides came very sparingly to hand, and were scarcely quotable in the Central Market Their average price was 6d. to 6¾d. per lb., or ¼d. less than in May. Short sides were in better request, and averaged 6¾d. to 7d. per lb. English beef was only supplied in small quantities, and averaged 5½d. to 5⅞d. per lb.

Port-Killed Beef.—There have been larger supplies of cattle from the States, and the quality was better than of late. Deptford-killed sides at Smithfield averaged 5¾d. to 5⅞d. per lb.

Chilled Beef.—As was the case with live cattle, chilled beef from North America showed an increased supply, and met with a very good demand. Its price steadily advanced all the month, and hindquarters averaged 5½d. to 6d. per lb., and forequarters 3d. to 3½d. Argentine

cheap, and realised considerably less than frozen. Average Smithfield prices for the month were 3¾*d.* to 4*d.* per lb. for hindquarters, and 2¼*d.* to 2½*d.* for forequarters.

Frozen Beef.—The trade was quiet but steady, and prices a fraction lower than in May. The averages were 3½*d.* to 3⅝*d.* for hinds, and 2½*d.* to 2¾*d.* for fores.

Carcass Mutton—Fresh-Killed.—Very little change took place in the value of British mutton. Scotch was fairly supplied, and varied during the month to the extent of ½*d.* per lb., but the averages were much the same as in May, viz., 7½*d.* and 7*d.* per lb. for first and second quality. English tegs made 6*d.* to 6⅝*d.* per lb. Dutch mutton began to arrive, and made almost exactly the same price as the English on offer.

Frozen Mutton.—The advance which took place at the end of May was fully maintained, and trade was very firm all the month. The best New Zealand averaged fully 4*d.* per lb., and Argentine and Australian about ½*d.* less.

Carcass Lamb.—There have been large supplies at the Central Market, and many complaints were heard of the difficulty in clearing the market of British lamb. New Zealand Canterbury lamb has established a firm hold, and at a far lower price competes very strongly with home produce. The latter averaged about 7½*d.*, 8½*d.*, and 9*d.* for the three qualities, New Zealand best generally fetching about 5*d.* to 5¼*d.* per lb.

Veal.—The demand for veal was disappointing, as many expected a good trade for the Coronation. Prices were considerably lower than in May, and the Smithfield average was only 6½*d.* to 7½*d.* per lb., Dutch realising about the same. There were many English calves on offer that were evidently slaughtered at a very few days old, and these sold at nominal prices.

Pork.—Supplies were naturally very small, but ample for the time of year, and 6*d.* per lb. was the top price for English, Dutch making about 5½*d.* and 5*d.* per lb.

THE PROVISION TRADE IN JUNE.

HEDLEY STEVENS.

Bacon.—The improved demand reported in May continued during most of the month of June, and just prior to the Coronation festivities all descriptions of hams experienced a further smart advance, the continued fine weather increasing the demand for that description of cured meat.

Arrivals from most countries showed an increase over the same period of last year, but there was not any accumulation of stock until the end of the month, when heavier stocks were reported from Liverpool, Manchester, and Hull, brought about by the labour difficulties at those ports. The arrivals from Russia were smaller, as the low prices prevailing for this description during May caused heavy losses to the curers, and, in consequence, they reduced their killings. American meats fluctuated considerably during the month, the tendency being towards higher prices. Their home trade is reported to be good, and, the stocks

of cured meats on hand being small, packers are independent sellers. During June, prices for American hogs ranged from $5.75 to $6.50, against $8.75 to $9.75 at the same time last year, and $7.00 to $8.15 two years ago.

English pigs were in fair supply, but are not being marketed freely, as breeders look for improved prices in the near future.

Cheese.—The consumptive demand improved somewhat during the month, but the trade was not brisk. Stocks of really best last season's makes were much reduced, and with the later arrivals of the new makes showing more quality, and being procurable at proportionately lower prices, the demand for the latter description increased. In sympathy with the cables from Canada, prices at the end of the month were a little higher.

Although the weather conditions in Canada during June were good, the make was not so large as expected. The arrivals into Montreal from May 1st to June 27th were 8,500 boxes less than for the same period of last year, although they included 15,000 States cheese shipped via that port early in the season.

Prices advanced in the United States beyond those current in Canada, and in consequence the exports were practically nil.

At the end of the month the estimated stocks of Canadian cheese at the three principal distributing centres (London, Liverpool, and Bristol) were 118,000 cheese, against 178,000 at the same time last year, and 104,000 two years ago. The stock of New Zealand cheese was 11,800 crates in London and Bristol, against 23,000 last year.

Stocks of English cheese are small, and it is generally reported that the make is smaller this year, partly because of the dry weather experienced during the greater part of May and June, but more especially on account of the increasingly large demand for milk for domestic purposes.

Butter.—There was a moderate trade throughout the month, but at the reasonable prices current the demand continued chiefly for best selections. The arrivals from Siberia were of very fine quality, but the quantity is expected to show immediate reduction on account of the very dry weather reported from that country, and consequently a falling off in the flow of milk. A few small shipments of Canadian butter arrived in England during the month, this being much earlier than last season. They cost the importers around 107*s*. c.i.f. per cwt. Best New Zealand butter was very scarce, as the season is practically at an end, but all descriptions of Australian were plentiful at near the prices current at the same time last year. Prices for Irish butter advanced during the month, which somewhat checked the consumption of this description, but with tinning operations in full swing, the Irish dealers were able to maintain their prices.

Eggs.—Although the warm weather somewhat reduced the consumption of eggs generally, the London demand was very good, owing

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of June, 1911.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	England. First Quality.	England. Second Quality.	Scotland. First Quality.	Scotland. Second Quality.
FAT STOCK:—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle:—	s. d.	s. d.	s. d.	s. d.
Polled Scots	8 4	7 10	38 9	35 11
Herefords	8 3	7 8	—	—
Shorthorns	8 1	7 5	37 9	35 3
Devons	8 2	7 5	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	8¾	7¾	8¾	7¼
Sheep:—				
Downs	7¼	6½	—	—
Longwools	6¾	6	—	—
Cheviots	8½	7¾	7¾	6¾
Blackfaced	8½	7¼	7¼	6½
Cross-breds	7¼	6½	7½	6¾
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs:—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	6 5	5 11	6 6	5 7
Porkers	6 11	6 5	6 9	5 11
LEAN STOCK:—	per head.	per head.	per head.	per head.
Milking Cows:—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	21 10	17 17	21 18	17 19
,, —Calvers	20 17	18 2	19 5	16 17
Other Breeds—In Milk ...	19 1	16 5	19 4	15 15
,, —Calvers ...	16 10	14 0	18 17	15 15
Calves for Rearing	2 9	1 16	2 16	2 0
Store Cattle:—				
Shorthorns—Yearlings ...	10 9	9 2	11 6	9 6
,, —Two-year-olds ...	14 11	12 17	14 9	13 4
,, —Three-year-olds	18 0	15 14	16 10	14 7
Polled Scots—Two-year-olds	—	—	16 18	15 4
Herefords— ,,	16 0	14 3	—	—
Devons— ,,	15 1	13 1	—	—
Store Sheep:—				
Hoggs, Hoggets, Tegs, and Lambs—	s. d.	s. d.	s. d.	s. d.
Downs or Longwools ...	37 11	33 1	—	—
Scotch Cross-breds ...	—	—	36 11	32 8
Store Pigs:—				
8 to 10 weeks old	[illegible]	[illegible]	[illegible]	[illegible]

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of June, 1911.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	Birmingham.	Liverpool.	London.	Manchester.	Edinburgh.	Glasgow.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF:—							
English	1st	53 6	53 6	54 0	54 6	53 6*	56 0*
	2nd	49 6	49 0	51 6	52 6	49 0*	53 6*
Cow and Bull ...	1st	46 6	44 0	46 6	47 6	45 0	46 0
	2nd	41 0	37 6	42 0	43 0	37 6	42 0
U.S.A. and Canadian:—							
Port Killed ...	1st	53 0	52 6	52 6	52 6	—	53 6
	2nd	50 0	47 6	50 6	50 6	—	51 6
Argentine Frozen—							
Hind Quarters...	1st	35 0	34 0	34 6	34 0	35 0	34 6
Fore ,, ...	1st	25 0	24 6	24 0	24 6	25 0	24 6
Argentine Chilled—							
Hind Quarters...	1st	38 0	37 0	38 0	38 0	38 6	40 0
Fore ,, ...	1st	26 0	26 0	22 6	26 0	25 6	26 6
Australian Frozen—							
Hind Quarters...	1st	34 0	32 6	34 6	32 6	—	33 6
Fore ,, ...	1st	25 0	23 6	24 0	23 6	—	24 0
VEAL:—							
British	1st	65 6	72 0	70 0	71 6	—	70 0
	2nd	58 0	66 6	60 6	66 6	—	—
Foreign	1st	—	—	70 0	—	70 6	—
MUTTON:—							
Scotch	1st	—	73 6	67 6	75 0	64 0	68 6
	2nd	—	67 0	63 0	70 6	52 6	58 6
English	1st	62 0	68 6	59 6	70 0	—	—
	2nd	54 6	64 0	53 6	63 0	—	—
Argentine Frozen ...	1st	35 0	35 0	33 0	35 0	34 0	33 6
Australian ,, ...	1st	34 6	32 6	33 0	33 0	36 0	31 0
New Zealand ,, ...	1st	—	—	37 0	—	—	35 6
LAMB:—							
British	1st	—	83 0	86 0	83 6	86 6	94 6
	2nd	78 0	73 6	79 6	79 0	—	83 0
New Zealand ...	1st	50 6	49 0	48 0	49 6	51 0	49 6
Australian	1st	44 0	42 6	42 6	42 6	—	39 6
Argentine	1st	44 6	43 6	42 0	43 6	—	39 6
PORK:—							
British	1st	59 6	61 6	54 6	62* 6	54 6	57 6
	2nd	54 0	56 0	49 6	58 0	47 0	55 0

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1909, 1910 and 1911.

Weeks ended (*in* 1911).	Wheat.						Barley.						Oats.					
	1909.		1910.		1911.		1909.		1910.		1911.		1909.		1910.		1911.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
Jan. 7 ...	32	9	33	6	30	5	26	11	24	11	23	11	17	5	17	2	17	0
,, 14 ...	32	8	33	8	30	8	27	1	24	11	23	10	17	5	17	7	17	2
,, 21 ...	33	2	33	9	30	11	27	3	24	11	24	4	17	8	17	6	17	4
,, 28 ...	33	0	33	6	30	11	27	6	25	0	24	5	17	9	17	4	17	3
Feb. 4 ...	33	4	33	7	30	9	27	7	24	10	24	5	17	10	17	7	17	5
,, 11 ...	33	8	33	4	30	5	27	8	24	9	24	6	17	11	17	11	7	5
,, 18 ...	34	1	33	0	30	3	27	11	24	6	24	7	18	0	18	0	17	6
,, 25 ...	34	5	32	7	30	2	28	0	24	2	24	9	18	0	17	10	17	7
Mar. 4 ...	34	10	32	7	30	0	27	11	24	6	25	0	18	2	18	1	17	5
,, 11 ...	35	8	32	6	30	1	28	4	24	1	25	0	18	2	18	0	17	5
,, 18 ...	35	9	32	6	30	1	28	0	23	6	24	11	18	5	18	0	17	6
,, 25 ...	36	0	32	9	30	2	28	0	23	7	25	0	18	6	17	11	17	5
Apl. 1 ...	36	5	33	0	30	3	27	10	23	8	24	11	18	8	18	0	17	5
,, 8 ...	37	4	33	6	30	4	28	0	23	1	24	7	18	10	17	11	17	7
,, 15 ...	38	7	33	7	30	3	27	8	23	5	25	2	19	2	18	3	18	3
,, 22 ...	41	4	33	7	30	4	28	2	23	0	25	5	19	9	18	3	17	10
,, 29 ...	42	5	33	0	30	11	27	10	22	10	25	5	20	0	18	3	18	3
May 6 ...	40	9	32	6	31	4	27	7	22	7	25	7	20	3	18	2	18	6
,, 13 ...	41	6	32	1	31	8	27	3	22	0	25	1	20	6	18	1	19	0
,, 20 ...	42	8	31	10	32	6	27	0	21	8	25	4	20	11	17	8	19	2
,, 27 ...	42	6	31	3	32	8	26	3	21	4	25	0	21	0	17	10	19	5
June 3 ...	43	1	30	2	32	5	25	7	21	8	24	10	21	3	17	10	19	5
,, 10 ...	42	11	29	1	32	4	26	10	20	9	25	7	21	4	17	10	19	7
,, 17 ...	42	7	29	0	32	3	26	10	18	11	23	11	21	6	18	0	19	8
,, 24 ...	42	8	29	4	31	11	27	2	20	1	23	9	21	7	17	9	19	10
July 1 ...	42	9	29	9	31	10	27	2	19	11	24	5	21	9	17	7	19	9
,, 8 ...	43	0	30	4	32	1	26	4	19	5	25	10	21	8	17	4	19	9
,, 15 ...	43	3	31	1			26	10	21	3			21	9	17	7		
,, 22 ...	44	0	31	11			27	4	19	9			22	5	17	5		
,, 29 ...	43	5	33	5			24	6	20	10			22	2	18	1		
Aug. 5 ...	44	9	33	9			27	4	20	5			22	11	18	3		
,, 12 ...	44	9	33	5			24	9	20	4			21	8	18	0		
,, 19 ...	41	6	32	11			23	11	20	11			19	8	17	11		
,, 26 ...	38	5	32	7			24	7	20	10			19	4	17	2		
Sept. 2 ...	37	2	32	2			26	3	22	10			19	6	17	2		
,, 9 ...	34	11	31	11			26	1	23	3			18	5	17	2		
,, 16 ...	33	6	30	11			26	5	24	3			17	9	16	6		
,, 23 ...	32	9	30	2			26	8	24	2			17	7	16	3		
,, 30 ...	32	2	30	1			26	9	24	4			17	2	16	4		
Oct. 7 ...	31	8	30	1			26	9	24	7			17	0	16	3		
,, 14 ...	31	4	30	2			27	0	25	1			17	0	16	2		
,, 21 ...	31	8	30	4			27	7	25	3			16	11	16	1		
,, 28 ...	31	10	30	4			27	9	25	4			17	0	16	2		
Nov. 4 ...	32	5	30	4			27	9	25	6			17	0	16	2		
,, 11 ...	32	5	29	11			27	7	25	4			17	1	15	11		
,, 18 ...	32	7	29	8			27	0	25	1			17	4	16	1		
,, 25 ...	33	0	29	11			26	8	24	10			17	3	16	4		
Dec. 2 ...	33	3	30	6			26	1	24	7			17	4	16	7		
,, 9 ...	33	3	30	9			25	7	24	3			17	3	16	9		
,, 16 ...	33	2	30	7			25	3	23	9			17	4	16	10		
,, 23 ...	33	1	30	7			25	2	23	10			17	4	16	9		
,, 30 ...	33	3	30	5			25	1	23	9			17	4	16	9		

Average Prices of **Wheat, Barley,** and **Oats** per Imperial Quarter in France, Belgium, and Germany, and at Paris, Berlin, and Breslau.

—		Wheat.		Barley.		Oats.	
		1910.	1911.	1910.	1911.	1910.	1911.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France:	May	42 1	46 9	25 9	27 2	21 10	22 8
	June	41 10	46 8	25 5	27 4	21 4	22 9
Paris:	May	44 0	49 3	24 8	25 7	22 3	23 11
	June	42 6	47 2	24 4	27 0	20 6	23 11
Belgium:	April	35 11	32 10	23 1	24 7	19 10	20 8
	May	35 4	34 11	23 8	24 11	20 1	21 10
Germany:	April	46 7	40 7	25 9	29 6	21 0	23 1
	May	44 0	42 5	24 10	29 2	20 7	24 2
Berlin:	April	48 3	42 10	—	—	21 11	22 3
	May	46 1	44 4	—	—	20 10	23 2
Breslau:	April	44 10	38 1	25 4* 24 2†	27 7* 23 7†	20 0	20 11
	May	41 0	39 7	25 4* 23 3†	— * 24 9†	19 6	22 7

* Brewing. † Other.

Note.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the German quotations are taken from the *Deutscher Reichsanzeiger*, the prices for the German Empire representing the average of the prices at a number of markets.

Average Prices of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of June, 1910 and 1911.

—	Wheat.		Barley.		Oats.	
	1910.	1911.	1910.	1911.	1910.	1911.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London...	29 9	32 9	20 11	25 1	19 2	20 2
Norwich	29 6	32 8	22 3	23 4	17 0	19 6
Peterborough	28 0	31 5	18 10	24 10	17 1	19 1
Lincoln...	29 5	31 2	—	—	17 3	19 1
Doncaster	28 6	31 9	22 4	23 10	17 9	19 5
Salisbury	28 8	31 6	20 7	21 11	16 4	19 11

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of June, 1911.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Bristol.		Liverpool.		London.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British ...	14 0	13 0	—	—	12 9	10 9	—	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish Creamery	107 0	103 0	104 6	102 0	108 0	105 6	104 6	102 6
,, Factory	96 0	89 0	91 6	83 0	97 0	91 0	—	—
Danish ...	—	—	114 6	112 0	112 6	111 0	109 6	—
French ...	—	—	—	—	116 6	113 0	—	—
Russian ...	99 0	94 6	98 6	94 6	99 0	97 0	97 0	93 6
Australian ...	101 0	96 0	—	—	102 6	99 0	—	—
New Zealand	107 6	104 0	—	—	106 6	104 6	—	—
CHEESE :—								
British—								
Cheddar ...	76 0	72 0	76 0	73 0	83 0	76 6	57 0	55 0
			120 lb.	120 lb.	120 lb.	120 lb.		
Cheshire ...	—	—	62 6	57 6	74 0	68 6	—	—
			per cwt.	per cwt.	per cwt.	per cwt.		
Canadian ...	62 0	60 0	55 6	54 6	64 0	62 6	55 0	—
BACON :—								
Irish	72 0	66 0	72 0	65 6	75 0	71 0	70 0	—
Canadian ...	62 6	59 0	62 0	58 6	63 0	61 0	—	—
HAMS :—								
Cumberland ...	—	—	—	—	105 6	99 0	—	—
Irish	—	—	—	—	108 0	104 0	101 0	—
American (long cut)	71 0	67 0	71 0	66 6	75 0	70 6	71 6	68 0
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British ...	8 11	—	—	—	9 9	8 11	8 5	—
Irish	8 10	8 6	9 0	8 3	9 2	7 10	8 4	7 10
Danish ...	—	—	9 4	8 10	9 6	8 4	—	—
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Langworthy ...	108 0	95 0	120 0	110 0	118 0	108 0	81 0	75 0
Scottish Triumph	110 0	100 0	106 6	96 6	109 0	99 0	—	—
Up-to-Date ...	107 0	93 6	106 6	96 6	113 0	102 0	75 0	70 0
HAY :—								
Clover ...	90 0	75 0	96 0	67 6	93 6	78 0	79 6	74 6
Meadow ...	77 6	60 0	—	—	83 0	62 0	—	—

DISEASES OF ANIMALS ACTS, 1894 to 1910.

NUMBER OF OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

Disease.	June.		Six Months ended June.	
	1911.	1910.	1911.	1910.
Swine-Fever:—				
Outbreaks	316	210	1,332	731
Swine Slaughtered as diseased or exposed to infection ...	4,180	1,832	14,977	6,508
Anthrax:—				
Outbreaks*	65	148	475	810
Animals attacked	91	168	592	981
Foot-and-Mouth Disease:—				
Outbreaks	—	—	1	—
Animals attacked	—	—	18	—
Glanders (including Farcy):—				
Outbreaks	16	27	104	178
Animals attacked	32	94	272	501
Sheep-Scab:—				
Outbreaks	6	5	303	315

* For 1910 the figures show the outbreaks reported, but for 1911 the outbreaks confirmed.

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

Disease.	June.		Six Months ended June.	
	1911.	1910.	1911.	1910.
Swine-Fever:—				
Outbreaks	14	17	63	57
Swine Slaughtered as diseased or exposed to infection ...	158	435	974	1,341
Anthrax:—				
Outbreaks	—	—	5	4
Animals attacked	1	1	6	7
Glanders (including Farcy):—				
Outbreaks	1	—	2	1
Animals attacked	1	—	3	2

SELECTED CONTENTS OF PERIODICALS.

Agriculture, General and Miscellaneous—

Weeds and their Destruction, H. C. Long. [B. 20–3.] The Chemistry of the Proteins, *T. B. Wood.* [B. 22–5.] (Trans. Highland and Agr. Soc. Scot., 5th Series, Vol. XXIII., 1911.)

France. Les écoles d'agriculture d'hiver, *J. B. Guillon.* (Bul. Mens. Off. Renseig. Agr. [Paris], April, 1911.) [B. 44–7.]

Guano Deposits of Assumption Island, Seychelles. [B. 24–3.] Preparation of Calcium Cyanamide and its uses as a Manurial Agent. Part I. [B. 28–3.] (Bul. Imperial Inst., Vol. IX., No. 1, 1911.)

Tableau de l'agriculture chilienne en 1910, *S. Cubillos-Valdivieso.* (Ann. Sci. Agron., May, 1911.) [A. 84.]

Field Crops—

Experiments in Crossing Turnips, *John H. Wilson.* [C. 32; B. 17.] Improvement of Hill Pasture as Determined by the Effect on Stock, *James Hendrick.* [C. 42–9.] Grass and Clover Seeds at Cockle Park, *Professor Gilchrist.* [C. 42–1.] (Trans. Highland and Agr. Soc. Scot., 5th Series, Vol. XXIII., 1911.)

Beet Sugar Factories, *H. Williams.* (Jour. Roy. Soc. Arts, May 12th, 1911.) [C. 34–5.]

The Cultivation, Production, Preparation, and Utilisation of Castor Seed. [C. 58–1.] Utilisation of Para Rubber Seed. [C. 58–3.] (Bul. Imperial Inst., Vol. IX., No. 1, 1911.)

The Ethics of Food. III. Bread. (Sci. Prog., No. 20, April, 1911.) [C. 6.]

The Growth of Tobacco for Nicotine Extraction, *G. H. Garrad.* [C. 54; E. 20–5.] The Soya Bean as an English Crop, *H. P. Hutchinson.* [C. 44–5.] On the Raising of New Varieties of Hops, *E. S. Salmon.* [C. 10.] The Estimation of Soft Resins in Hops, *R. H. Carter.* [C. 10.] (Jour. South-East. Agr. Col., Wye, No. 19, 1910.)

Plant Diseases—

Investigations on Potato Diseases, *G. H. Pethybridge.* [E. 60–37.] The "Bladder-Rust" of Scots Pine, *G. H. Pethybridge.* [E. 60–17.] (Dept. Agr. and Tech. Instr. Ireland Jour., April, 1911.)

Notes on Fruit Flies (Trypetidæ) with Descriptions of New Species, W. J. Froggatt. (Proc. Linn. Soc. N.S. Wales), Vol. XXXV., Part 4, 1910.) [E. 40–15.]

Fifth Annual Report of the Honorary Consulting Biologist to the Land Agents' Society, *W. E. Collinge.* (Jour. Land Agents' Soc., June, 1911.) [E. 2.]

Italie. Loi du 24 mars 1904 pour la destruction de la *diaspis pentagona.* Règlement pour l'application de la loi du 24 mars, concernant la destruction de la *diaspis pentagona.* [E. 6.] La *diaspis pentagona, G. Gastine.* [E. 40–51.] (Bul. Mens. Off. Renseig. Agr. [Paris], April, 1911.)

Untersuchungen über die Wirkung des Karbolineums als Pflanzenschutzmittel, *E. Molz.* (Centbl. Bakt. [etc.], 2e Abt., Band 30, Nos. 7–12, 1911.) [E. 20–5.]

The Chemistry of the Lime-Sulphur Wash, *W. B. Burgess.* [E. 20–5.] "Sooty Blotch," a New Fungous Disease of Apples, *E. S. Salmon.* [E. 60–11.] "Brown Rot," Canker of Apple Trees, *E. S. Salmon.* [E. 60–11.] On the Occurrence of New York Canker in England (*Sphæropsis malorum*), *E. S. Salmon.* [E. 60–11.] (Jour. South-East. Agr. Col., Wye, No. 19, 1910.)

Stock—

rigin of the Clydesdale and other Heavy Breeds of Horses, *J. Cossar Ewart.* (Trans. Highland and Agr. Soc. Scot., 5th Series, Vol. XXIII., 1911.) [F. 64–1.]

Dairying and Food, General—

Variation in the Composition of Cows' Milk with Advance of Lacta *C. Crowther.* [G. 56–3.] Cost of Winter Feeding in Milk Produ *M. J. R. Dunstan.* [G. 50–1.] *Influence of Temperature on* Milk Ventilation of Cow Byres, *C. Douglas.* [G. 50–5.] Milk Rec *C. Douglas.* [G. 56–7.] (Trans. Highland and Agr. Soc. Scot., Series, Vol. XXIII., 1911.)

Veterinary Science—

The Warble Fly. (Dept. Agr. and Tech. Instr. Ireland Jour., April, 1 [H. 50–5.]

"Struck" Sheep: Trials of Preventive Treatment, *T. W. Cave.* (*South-East Agr. Col.*, Wye, No. 19, 1910.) [H. 42–1.]

Birds, Poultry, Bees, &c.—

Grouse Disease, *A. E. Shipley.* (Sci. Prog., No. 20, April, 1 [K. 18–3.]

Forestry—

The Need of Afforestation in the United Kingdom of Great Britain Ireland. I., *A. D. Blascheck.* (Sci. Prog., No. 20, April, 1 [L. 2–1.]

Afforestation in Scotland; Forest Survey of Glen Mor and a Consider of Certain Problems arising therefrom, *Lord Lovat* and *Capt. Stirli Keir.* (Trans. Roy. Scot. Arbor. Soc., Vol. XXV., 1911.) [L. 2–1

Economics—

The Rural Exodus in France. (Dept. Agr. and Tech. Instr. Ireland J April, 1911.) [N. 16.]

Die Bewegung der Löhne der ländlichen "freien" Arbeiter, *Anna mann.* (Land. Jahrb., Band XL., Ergänzungsband III., 1 [N. 22–7.]

Cheshire County Council Small Holdings, *W. McCracken.* (Trans. Inst., Vol. XLIII., Part XII., 1911.) [N. 14–5.]

Historical and Statistical Sketch of the Present State of Agricultura operation in Germany. [N. 4–7.] Co-operative Land Credit Societi Germany. The "Landschaften" and "Ritterschaften." [N. *Agricultural Co-operation in Austria.* [N. 4–7.] *The New [1910] I* lation for the Preservation of Peasant Property in Austria. [N. 1 Agricultural Co-operation in Denmark. [N. 4–7.] Agricultural operation and Organisation in the United States. [A. 80; N. Agricultural Organisation in Great Britain and Ireland [including operation and Credit]. [A. 2; A. 22; N. 4–3.] The Present Sta Agricultural Co-operation in Italy. [N. 4–7.] Co-operation in J [N. 4–7.] (Bul. Econ. and Social Intel., Int. Inst. Agric., Vol. I., N Sept., 1910.)

Present Condition of Agricultural Association in Germany. [A. N. 4–7.] The Organisation of Agricultural Credit in Turkey. [N. The Taxes and Fiscal Questions affecting Co-operative Societies in [N. 4–7.] Agricultural Co-operation in Norway. [N. 4–7.] Agricul Co-operation in the Netherlands. [N. 4–7.] Agricultural Co-oper and Association in Portugal. [A. 46; N. 4–7.] Agricultural Associa in Roumania. [A. 54; N. 4–7.] Agricultural Co-operation in Sw [N. 4–7.] Organisation of Agriculture in Switzerland [including operative, Credit and Insurance]. [A. 52; N. 4–7.] (Bul. Econ. Social Intel., Int. Inst. Agric., Vol. I., No. 2, Oct.-Nov., 1910.)

Present Condition of Non-Co-operative Agricultural Association in Au [A. 34.] Agricultural Organisation in Belgium [including Co-opera Credit and Insurance]. [A. 25; N. 4–7.] Organisation of Agricu in Cuba [including Credit]. [A. 100; N. 6–5.] Agricultural Co-oper

ADDITIONS TO THE LIBRARY.

[NOTE.—The receipt of *annual* publications of foreign agricultural and other departments, experiment stations and societies is not noted in the monthly list of additions to the Library. A list of these publications appeared in the *Journal* for October, November, and December, 1909.]

Agriculture, General and Miscellaneous—

Burchard, O.—Die Unkrautsamen der Klee- und Grassaaten mit besonderer Berücksichtigung ihrer Herkunft. (100 pp. and plates.) Berlin: Paul Parey, 1900. [B. 18; B. 20–1.]

Harz, C. D.—Landwirtschaftliche Samenkunde. (1362 pp.) Berlin: Paul Parey, 1885. [B. 18.]

Wyoming Agricultural Experiment Station.—Preliminary Bull. No. 88:—Woody Aster (*Xylorrhiza Parryi*, Gray). (20 pp.) Laramie, Wyoming, 1911. [B. 20–11; H. 42–1.]

Report of the Departmental Committee on the Science Museum and the Geological Museum. [Cd. 5625.] (32 pp.) London: Wyman and Sons, 1911. 3*d*. [B. 36; B. 44–5.]

Burton, J. H.—The Teaching of Nature Study. [Reprinted from the Jnl. of the Bath and West and Southern Counties Socy., Vol. V. Fifth Series.] (8 pp.) Bath, 1911. [B. 44–1.]

Peet, J. O., and *Taylor, H.*—Principles and Practice of Book-keeping for the Farm, Garden, Dairy and Estate. (215 pp.) Reading: H. Taylor, 1905. [B. 50.]

U.S. Dept. of Agriculture, Bureau of Chemistry.—Circ. No. 71:—Extraction of Grains and Cattle Foods for the Determination of Sugars: A Comparison of the Alcohol and Sodium Carbonate Digestions. (14 pp.) Washington, 1911. [B. 22–5; F. 74–1.]

System of Departmental Accounts for Agriculture. Leicester: J. McQueen and Co. 15*s*. 9*d*. [B. 50.]

Australia, Its Land, Conditions and Prospects. The Observations and Experiences of the Scottish Agricultural Commission of 1910–11. (303 pp.) London: W. Blackwood and Sons, 1911. 1*s*. net. [A. 85.]

Wilts County Council, Agricultural Education Committee.—Results of the Field Manurial Demonstrations, 1909–10. (73 pp.) 1911. [B. 46.]

James, J. A. Barbour.—The Agricultural and other Industrial Possibilities of the Gold Coast. (109 pp.) London: St. Bride's Press, 1911. 2*s*. 6*d*. [A. 72.]

Wisconsin Agricultural Experiment Station.—Bull. No. 202:—The Management of Heavy Clay Soils. (17 pp.) [B. 40–1.] Bull. No. 204:—The Improvement of Sandy Soils. (25 pp.) [B. 40–1.] Bull. No. 205:—The Development of Marsh Soils. (22 pp.) [B. 40–1.] Madison, Wisconsin, 1911.

Hopkins, Cyril G.—Soil Fertility and Permanent Agriculture. (653 pp.) London: Ginn and Co., 1910. 10*s*. 6*d*. [B. 40–1.] [The author is the Professor of Agronomy in the University of Illinois.]

Seltensperger, C.—Lectures Agricoles. (576 pp.) Paris: J. B. Baillière et Fils, 1911. 6 fr. [B. 8–1.] [A collection of papers by well-known French agricultural writers.]

Russell, E. J.—Lessons on Soil. (132 pp.) Cambridge: University Press, 1911. 1*s*. 6*d*. [B. 40–1.]

Pammel, L. H.—Weeds of the Farm and Garden. (281 pp.) New York: Orange Judd Co., 1911. 7*s*. 6*d*. net. [B. 20–1.]

Massachusetts Agricultural Experiment Station.—Bull. No. 137:—The [illegible] The Distribution, Composition and Cost of

Punnett, R. C.—Mendelism. [Third edition.] (176 pp.) London: Macmillan and Co., 1911. 5s. net. [B. 17.]

Deutsche Landwirtschafts-Gesellschaft.—Arbeiten. Heft 180:—Buchführungsergebnisse aus der Buchstelle der D.L.G. (64 pp.) [B. 50; A. 28.] Heft 183:—Betriebsverhältnisse der deutschen Landwirtschaft. Stück IX. (68 pp.) [A. 28.] Heft 184:—Landwirtschaftliche Reisebilder aus England und Schottland. (68 pp.) [A. 2; A. 12.] Heft 185:—Betriebsverhältnisse der deutschen Landwirtschaft. Stück X. (111 pp.) [A. 28.] Heft 186:—Betriebsverhältnisse der deutschen Landwirtschaft. Stück XI. (170 pp.) [A. 28.] Berlin: Paul Parey, 1911.

Royal Commission on Coast Erosion and Afforestation.—Vol. III., Part I.:—Third (and Final) Report [on Coast Erosion]. [Cd. 5708.] (177 pp. and plates.) London: Wyman and Sons, 1911. 3s. [B. 56.]

Field Crops—

South Dakota Agricultural Experiment Station.—Bull. No. 124:—Progress of Grain Investigations. (17–55 pp.) Brookings, South Dakota, 1910. [C. 22–1.]

University College of N. Wales, Bangor, Agricultural Dept.—Bull. No. VII.:—Growth of Linseed, 1910. (4 pp.) [C. 48.] Bull. No. VIII.:—Manuring of Potatoes, 1910. (4 pp. and table.) [C. 26–5.] Bangor, 1911.

Wyoming Agricultural Experiment Station.—Bull. No. 83:—Barley. (12 pp.) Laramie, Wyoming, 1910. [C. 8.]

Planchon, Dr. Louis.—Mutation Gemmaire du *Solanum Commersonii*, Dun. (49 pp. and plates.) [Annales de la Faculté des Sciences de Marseille, Tome XVIII., Fascicule I., 1909.] [C. 26–11.]

Nevada Agricultural Experiment Station.—Bull. No. 75:—The Sugar Beet Industry in Nevada. (38 pp.) Reno, Nevada, 1911. [C. 34–3.]

Louisiana Agricultural Experiment Station.—Bull. No. 125:—The Bacterial Deterioration of Sugars. (88 pp.) Baton Rouge, Louisiana, 1911. [C. 34–3; B. 42.]

U.S. Dept. of Agriculture.—Farmers' Bull. No. 436:—Winter Oats for the South. (32 pp.) Washington, 1911. [C. 16.]

Saskatchewan, Dept. of Agriculture.—Bull. No. 24:—Hints for Flax Growers. (16 pp.) Regina, 1911. [C. 48.]

California Agricultural Experiment Station.—Bull. No. 211:—How to Increase the Yield of Wheat in California. (253–314 pp.) Berkeley, California, 1911. [C. 2–1.]

Hart, J. Hinchley.—Cacao, Its Cultivation and Curing. (307 pp.) London: Duckworth and Co., 1911. 7s. 6d. net. [C. 58–1.]

Spencer, Guilford L.—A Handbook for Chemists of Beet-Sugar Houses and Seed-Culture Farms. (475 pp.) New York: J. Wiley and Sons, 1910. $3.00. [C. 34–1.]

Memoirs of the Dept. of Agriculture in India, Botanical Series.—Vol. IV., No. 1:—Millets of the Genus Setaria in the Bombay Presidency and Sind. (8 pp. + 5 plates.) Calcutta, 1911. [C. 21.]

Pennsylvania Agricultural Experiment Station.—Bull. No. 109:—Some Soiling Crops for Pennsylvania. (20 pp.) Centre County, Pennsylvania, 1911. [C. 44.]

Cornell Agricultural Experiment Station.—Bull. No. 294:—A Heretofore Unnoted Benefit from the Growth of Legumes. (363–374 pp.) Ithaca, New York, 1911. [B. 28–5.]

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THE JOURNAL

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REPORT OF THE DEVELOPMENT COMMISSIONERS.

THE Development Commissioners, who were appointed under the Development and Road Improvement Funds Acts, 1909 and 1910, have recently issued a Report [H.C. 199. Price 3*d.*] on their proceedings during the period from the 12th May, 1910 (the date of their appointment), to the 31st March, 1911. In view of the fact that a substantial proportion of the Fund established by these Acts is to be devoted to the promotion of agriculture, forestry, and rural industries, the Report is of great interest to agriculturists.

The opening portion of the Report is devoted to a statement of the general principles governing the Commissioners' action, apart from the procedure laid down in the Act of 1909.

It is stated that: "The first of these principles is that, to deal satisfactorily with many of the purposes mentioned in the Act of 1909, it is absolutely necessary to work on a comprehensive policy, which shall provide for and take account of the whole of at least one of the three main administrative divisions of the United Kingdom (viz., England and Wales, Scotland, and Ireland), and shall, wherever possible, be based on a survey of the position and needs of the whole kingdom in relation to that particular subject. Take, for instance, the very important question of research in agricultural science. Numerous applications for advances from the Development Fund for different branches of research and

pieces of research work were expected, and have, in fact, been made by bodies, institutions, and associations all over the kingdom. It seemed to the Commissioners that there would inevitably be waste of energy and money if these applications were simply taken one by one as they arrived, and advances recommended to those institutions which made out a good case for themselves, irrespective of other institutions and the work done by them. It is probably neither desirable nor possible to prevent all overlapping and duplication of work, and the Commissioners realise that individual investigators and institutions cannot and ought not to be dragooned into uncongenial tasks. But looking to the vast amount of work still to be done, they think that any advances from the Fund for this purpose should be made on a coherent and comprehensive scheme, covering as wide an area as possible. The result of the absence of such a plan might well be that research work subsidised from public funds would be unnecessarily duplicated, or that one institution would undertake some enticing problem with which it was fitted to deal, but not so well fitted as another institution in a different part of the country, or that there would be concentration of effort upon one part of the field of agricultural research, while other parts, no less important scientifically and economically, but for some reason less attractive, were left neglected and unexplored.

"Agricultural research has been taken as an example, but it will be obvious that similar considerations apply to other purposes for which advances may be made from the Fund. The Commissioners do not lay it down as a hard-and-fast rule that under no circumstances, however special, will they recommend an advance from the Development Fund apart from an examination of all possible or probable applications of the same nature or apart from a general scheme applicable to the whole country or a large part of it; and the necessity of such a scheme varies with the purpose for which advances are desired. But, for the reasons briefly indicated above, they feel that as a rule an application should be considered not simply and entirely as a disconnected unit, but in the light of a policy which takes account of the requirements of a wider area than a single district or institution."

out that they do not think that it would be consistent with their duty to recommend an advance from the Development Fund until a fairly detailed scheme for the expenditure of the money is framed and approved, and that they do not propose, as a general rule and subject in certain cases to considerations of practical convenience, to recommend advances from the Development Fund in relief of existing expenditure, whether from Parliamentary votes, local rates, or other sources. They propose to proceed rather on an opposite plan. So far from recommending advances in relief of existing expenditure, they contemplate using the Fund, within reasonable limits, as a means of provoking expenditure from other sources.

Policy in Regard to Agricultural Development.—Having regard to the amount of the Development Fund, they propose to deal with the problem of agricultural development by devoting their attention principally to three lines of action. They aim first at increasing the amount and quality of the product of agriculture by assisting the extension of a system of scientific investigation and research, and, with it, of a system of education which will, so far as possible, ensure that the results of investigation and research are known and utilised in practice; and secondly, they aim at increasing the variety of production, by placing the cultivator in a position to know whether he can add certain new crops and industries to the existing number with a reasonable probability of profit. Finally, looking at the problem from a rather different and more strictly commercial point of view, they propose to encourage in particular the organisation of co-operation—a subject which is expressly named in the Act.

It is not really possible immediately to do a great deal in regard to the first and third of these three lines of action by the simple process of spending a great deal of money, for the reason that there are not the men available. Nothing has impressed the Commissioners more than the clearness with which the fact has appeared that the first condition of any considerable progress in these ways is the creation of a trained staff. It is useless to expect that immediate results of real value can be obtained on a large scale merely by expenditure. One example is sufficient: the number of men [illegible] try

is at present exceedingly small, and it obviously cannot be increased at a moment's notice.

The problem of increasing the variety of production is likely to raise difficult questions both of principle and practice. It is enough at this early stage to name flax, hemp, tobacco, and beet as particular crops to which the Commissioners propose to give attention, with a view to ascertaining whether they can be grown in this country on a commercial basis, and to possible schemes for advances from the Development Fund for that purpose. They have appointed two gentlemen of scientific training to investigate by inquiry at home and abroad, and to systematise for their use the information available in regard to the first three of these crops. In regard to beet, they propose to consider in consultation with the Government Departments concerned the question whether it is possible to make an experiment on a fairly large scale, designed to show not whether beet of good quality can be grown in this country (a point which they think may be regarded as settled), but whether it can be grown at a profit.

The fact has to be faced that such experiments are not very cheap, and that they may fail. But even in that case, the Commissioners venture to suggest that, though lost, the money spent will not have been wasted. It may be regarded as the price paid for the knowledge that under existing conditions a certain crop is not commercially possible in this country, and its loss may prevent for the future the useless expenditure of money and effort on a far larger scale.

Policy in Regard to Forestry.—On the subject of forestry development the Commissioners have formulated for their guidance in considering British schemes and applications, the following principles:—

(*a*) That the first requirement for such development is effective education in forestry at suitable centres, regulated by organised research and demonstration.

(*b*) That no scheme of State afforestation on a large scale can be considered until investigation has shown where State forests might be economically and remuneratively provided (regard being had to the interests of other rural industries), and until a trained body of foresters has become available.

above purposes should include provision for the creation and maintenance of such staff as may be necessary to give practical advice and assistance to those who desire to undertake afforestation or to develop existing afforested areas.

It will be gathered that in considering their action in this, as in other directions, the Commissioners have been faced at the outset with the difficulty that the number of trained men in this country capable of directing forestry operations on any large scale is at present very small. Before all else they think it necessary that this difficulty should be overcome.

Agricultural Research and Education in England and Wales.—The Report then proceeds to describe the negotiations which were carried on during the year with a view to the settlement of a general scheme to be administered by the Board of Agriculture and Fisheries for the organisation of a system to aid and develop agriculture by the provision of technical advice for farmers and by promoting scientific research and experiments in the science, methods, and practice of agriculture. A final conclusion was not reached by the end of the year, but the Commissioners informed the Board that they were willing to contemplate an expenditure of £40,000 per annum for research work alone, apart from advisory and other work.

The Board of Agriculture and Fisheries, however, suggested to the Commissioners that certain interim grants should be made through the Board to certain institutions, to enable them to carry on approved lines of investigation during the year 1911–12, at the end of which period it was anticipated that the requirements of agricultural research would be dealt with under the general scheme. The Commissioners stipulated that the institutions concerned should be made clearly to understand that the grants were provisional and without prejudice to the general scheme under consideration, and that they would not be renewed in subsequent years, except in so far as the institutions were found eligible for grants under the general scheme.

The Commissioners then decided to recommend that the following grants, or such proportion as might be required for the financial year, should be paid to the Board for the benefit of the institutions named below, and for the purposes

	£
Cambridge University.—Research work	4,000
Bristol University.—(1) Bio-chemical investigations on cheese; (2) investigation of teart land	500
Yorkshire Council for Agricultural Education (Leeds University).—Investigation of atmospheric impurities .	210
University College, Reading.—General work on (1) Microflora of cheese; (2) cereal selection	250
South-Eastern Agricultural College, Wye.—(1) Investigations on tobacco; (2) Mycological Department; (3) Entomological Department; (4) Investigations on hop resins	350
University College of Wales, Aberystwyth.—Botanical survey of Aberystwyth, and subsidiary inquiries ...	156
Harper Adams Agricultural College.—Research on wart disease, and finger and toe	190
Royal Veterinary College.—Investigations in respect of animal diseases	1,390
The Incorporated Society for Extending the Rothamsted Experiments	2,000
The British Dairy Institute, Reading	60
Woburn Experimental Station	600

The Commissioners further intimated to the Board that they would be prepared to recommend additional interim grants not exceeding in the aggregate a sum of £3,000 to certain other institutions which had not been reported on up to that time. They also informed the Board that they would be ready to recommend a grant of £1,000 to make provision for scholarships during the financial year so soon as a scheme could be prepared.

With regard to agricultural instruction (so far as it lies within the province of the Board of Education), the Commissioners, after negotiations, stated on the 2nd March that they were prepared to recommend the Treasury to allocate £65,000 per annum for agricultural education in England and Wales, on the submission and approval of a scheme for the expenditure of that sum through the Board of Education and Local Education Authorities.*

The Report also deals with the applications made by the Scotch Education Department and the Irish Department of Agriculture.

Co-operation.—On the 3rd September, 1910, an application was made by the Board of Agriculture and Fisheries for

co-operation among agriculturists in England and Wales, and the Commissioners also had before them an application from the Agricultural Organisation Society, and took evidence in connection with both applications. An interim grant to the Society was contemplated at the close of the year.

Horse and Live Stock Breeding.—The Commissioners received on the 26th July, 1910, an application by the Board of Agriculture and Fisheries for a grant of £50,000 per annum, of which £5,000 was to be devoted to live-stock other than horses, and £45,000 to the encouragement of light-horse breeding in Great Britain, and after taking evidence the Commissioners recommended the Treasury to advance £36,000 for one year to the Board by way of grant, to be expended generally as follows:—

	£
(*a*) Payment of premiums to the owners of stallions ...	13,000
(*b*) Encouragement of the keeping of brood mares ...	10,000
(*c*) Free nominations for the service of mares by premium stallions	3,000
(*d*) Purchase of stallions	5,000
(*e*) Registration of stallions	5,000

In order to secure the elasticity which they considered necessary to the inauguration of a new scheme, the Commissioners reported that in their opinion the Board should be allowed some latitude in making transfers from one head of expenditure to the other, and in altering the character of their operations in detail.

The Commissioners suggested further that in the event of the Treasury favourably considering their recommendation, it should be intimated to the Board that the Treasury and the Commissioners will be prepared, if the result of the first year's working seems to justify a continuance of the experiment, and the state of the Development Fund permits of further advances, to consider favourably an application for a second grant at or near the end of a year from the date when the first advance was made—assuming that by that time it had been almost or quite exhausted.

The Commissioners recommended also as a condition of the advance that a majority of the members of each of the local committees formed under the scheme should be nominated by the County Council or Councils concerned.

The details of the scheme for the promotion of live-stock breeding had not been submitted to the Commissioners at the end of the year.

A grant of £10,000 per annum for five years was recommended for the extension of the existing horse-breeding schemes of the Irish Department of Agriculture.

Forestry.—The Commissioners received on the 25th March, 1911, through the Treasury, a memorandum from the Board of Agriculture and Fisheries, outlining a comprehensive scheme of forestry for England and Wales. The immediate advance desired is £9,300 for the year 1911–12, but the ultimate expenditure contemplated is very much larger. The Commissioners are communicating with the Board on the subject.

Schemes for the promotion of forestry in Scotland and Ireland were also under consideration, and in regard to Scotland, the Commissioners have agreed to the provision of a central demonstration area—for the acquisition of which preliminary steps are being taken—and of a forestry school in connection with it; and also to the provision of small forest gardens for the local use of the agricultural colleges.

In regard to Ireland, they have agreed to advances of £25,000 or £30,000 for the purchase of land, and to further advances, as soon as formal and definite applications are made under the Act, for additions to staff and for the maintenance and management of small woodlands in the hands of County Councils.

Other Applications.—The Commissioners also had before them applications for the development and improvement of fisheries, the construction and improvement of harbours and of inland navigations, as well as some miscellaneous applications.

Summary.—The sums of which the Commissioners have either recommended the allocation, or agreed to recommend it as soon as satisfactory schemes are framed, amount roughly to £165,000 per annum, and £100,000 non-recurring advances. By far the larger proportion of this expenditure, if ultimately approved by the Treasury, will go in agricultural research and instruction, viz., England and Wales £105,000 per annum, Scotland a lump sum of £60,000 and £5,000

These figures do not take account of the considerable sums, of which no definite estimate can yet be given but for which schemes were either being prepared or were under examination by the Commissioners at the close of the year, *e.g.*, forestry in England and Wales, the purchase of a demonstration area in Scotland and the establishment there of a central school of forestry, the development of Irish fisheries and fishery harbours, and the encouragement of the organisation of co-operation throughout the United Kingdom. Nor do they take account of applications which had not reached the Commissioners, though known as having been made or about to be made to the Treasury—as, for instance, schemes for the development and improvement of British fisheries and of Scotch harbours; nor again of possible expenditure on such projects as the revival of the flax and hemp industries, the encouragement of tobacco and beet cultivation, or the establishment of an institution for the study of rural economics.

In the first nine months of their work the Commissioners, so far as they are concerned, have allocated, and, as they think, rightly allocated, one-third of the annual income guaranteed to the Development Fund for five years. Out of the two-thirds which now remain they hope to provide during the coming year for considerable annual expenditure on such purposes as forestry and forestry instruction and the organisation of co-operation; and it cannot be supposed that expenditure on the purposes with which they have already dealt ought to or will remain stationary at the amounts provisionally fixed. Looking to these facts, the Commissioners state that they cannot but feel some apprehension that unless Parliament comes to the aid of the Fund its position in a very few years will not be a strong one. They will, however, be far more able to form an opinion on this important question at the end of the financial year 1911–12, by which time they hope that all the applications hitherto made to the Treasury will have reached them from the Government Departments, that considerable schemes known to be in preparation will have been submitted, and that the inquiries which they are making into such subjects as flax, hemp, and tobacco cultivation will have been completed, or be on the point of

TOBACCO GROWING FOR INSECTICIDAL PURPOSES.

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NICOTINE, the active principle of tobacco, has long been known amongst fruit-growers as a very efficient insecticide. It is, in fact, one of the most effective general insecticides we have. Its effects are more lasting than those of any other wash, especially if a small amount of soft soap is mixed with it, and it does no harm to the foliage or to delicate blossoms. Its penetrating power enables it to reach the inner surface of curled up leaves, and when desired it can be mixed with a sulphur wash for a combined attack on aphis, caterpillars, and mildews.

The price at which nicotine is sold on the market, however, makes it too expensive for use for ordinary commercial purposes. With nicotine (96 per cent. pure) at 15*s*. per lb., and using 1 1·5 oz. nicotine in 10 gallons of water, the cost of the wash works out at nearly 1½*d*. per gallon. Professor Theobald considers 1 oz. nicotine per 10 gallons water quite sufficient if a small quantity (5 oz.) of soft soap is added. This reduces the cost to about 1*d*. per gallon, but even this price is much too high for general purposes.

To test the possibility of growing the tobacco merely for insecticidal purposes experiments have been carried out during the past year at the South Eastern Agricultural College.

In this connection the Excise Regulations respecting the growing of smoking tobacco in this country are of primary importance, but it must be remembered that for nicotine extraction the variety grown would probably be a snuff variety, unsuitable for smoking on account of its pungent character, and rendered still more so by the special treatment it would receive to increase its nicotine content. The fruit-grower, moreover, when growing his own insecticide, would not cure the leaves at all, so that the tobacco would never be in a fit state for smoking, and lastly, to eliminate all possi-

purposes, there seems to be no objection to de-naturing the crop by spraying the plants before or after they are cut with some objectionable substance so as to render them incapable of being smoked. At present, however, tobacco can only be grown in England by persons possessing an Excise licence on land approved by the Excise Commissioners, and in accordance with the prescribed Regulations, a summary of which was given in this JOURNAL, February, 1911, p. 943.

The fruit-grower would reap many advantages by growing his own crop rather than by buying the manufactured leaf. He would save the duty; he would save the cost of curing and fermenting (operations in which a large amount of nicotine is lost), and he would save the cost of carriage and middlemen's profits. An exceptionally rank variety of tobacco containing the highest percentage of nicotine would be selected, and as large a crop as possible would be grown without regard to the question of quality from the smoking point of view. All these circumstances would tend to reduce the cost, and he would get a much cheaper article and an article much better suited to his purpose than any he could purchase.

Nor is it the fruit-grower only who would reap the advantage of growing his own tobacco. The hop-grower and also the sheep-farmer would gain quite as much. The worst insect enemy which the hop-grower has to fight against is undoubtedly the Hop Damson Aphis, or "Hop Fly" (*Phorodon humuli*), and against this pest nicotine wash is considerably more effective than the commonly used soft soap and quassia. Then, again, nicotine is very effective as a sheep-dip. It destroys both the sheep ked (*Melophagus ovinus*), and the sheep-scab mite, without injuring either the sheep or the wool. In fact, it was by compulsory dipping with either a tobacco and sulphur dip or a lime and sulphur dip that sheep-scab was exterminated from New Zealand. The fruit-farmer, the hop-grower, and the sheep-breeder and feeder would therefore all gain if the price of nicotine could be so reduced as to be within the reach of everybody.

The experiments which were conducted at Wye last year dealt chiefly with questions of cultivation, and they demonstrated that tobacco can be grown to maturity in this country,

and that with a suitable variety and a good soil a satisfactory crop could be obtained. When the leaves are dried it is possible to extract about 95 per cent. of the nicotine simply by soaking the powdered leaves in water. Investigations are, moreover, being carried out in the Chemical Laboratory of the College by Mr. Edwardes-Ker with a view of discovering a simple and inexpensive method by which the grower can extract the whole of the nicotine. No statement can at present be made on this point, but in the meantime an account of the method of cultivation, based on the experiments at Wye last year, may be of interest.

Varieties Grown.—There are two species of tobacco commonly grown for smoking purposes, *Nicotiana Tabacum* and *Nicotiana rustica,* both belonging to the same natural order as the potato and the tomato—the natural order *Solanaceæ.* *Nicotiana Tabacum* is the commonest, and is easily distinguished by its red tubular flowers and long and moderately narrow leaves. It is the species that provides all the best types of smoking tobaccos. The other species, *Nicotiana rustica,* has a yellow flower of quite a different shape from that of *N. Tabacum.* It is a much shorter plant, and bears large wide leathery leaves rather resembling cabbage leaves. It is a much coarser plant altogether than *N. Tabacum,* and as coarseness as a rule means high nicotine content it is probable that this species will be more likely to suit the purpose of the nicotine grower than the one ordinarily grown for smoking tobacco. Moreover, it has other advantages in that it is hardier and matures earlier than *N. Tabacum,* and consequently it is more suited to our short English summer.

Of these two species twenty varieties were tested, the seed being obtained from the United States, the Transvaal, India, Italy, and Ireland.

Sowing the Seed.—Owing to the short summer tobacco cannot be grown entirely out of doors in this country, and the seed has to be started under glass. An ordinary garden frame consisting of three "lights," each measuring 6 feet by 4 feet, and resting on a hot-bed, was found a suitable form of seed-bed. The hot-bed should consist of fresh horse manure

be allowed to heat until just before the beds are made. It should be about nine inches to a foot deep, or at the rate of about one ton of manure per 6 feet by 4 feet sash. The glass-covered frame should then be placed on the top of the manure without any delay, and the heap covered with about two inches of finely prepared soil in which to sow the tobacco seed.

Tobacco seed is extremely small and consequently very difficult to sow thinly and evenly. The best way is to mix the seed with a large quantity of ashes so as to increase the bulk. It can then be sown more thickly, and there is the additional advantage that the colour of the ashes shows up against the soil, so that the sower can see when any part of the seed bed is left unsown.

The quantity of seed sown was one-thirtieth of an ounce to each sash, but this was found to be too much, and one-fortieth of an ounce of seed would be quite sufficient. The sowing was done on March 23rd.

Planting Out, Soil and Manuring.—The young plants may be put out in the open as soon as all danger of frost is over, about the end of May. The most suitable soil for the production of nicotine, so far as the experiments have shown at present, is a moderately heavy rich loam with liberal manuring. A good foundation in the form of dung in the autumn will be required, followed by a good dressing of artificials in the spring before planting out. Nitrogenous manures especially seem to encourage the formation of nicotine, so that two or three small dressings of nitrate of soda after the plants have become established will be found useful.

The soil must be thoroughly well worked and reduced to a fine tilth before planting out. The rows should then be marked out with an empty drill 3 feet or 2½ feet apart, and the plants dibbled in after the manner of cabbages at distances of 2 feet or 1½ feet in the rows. Foreign experiments have shown that the closer the plants are put together the higher becomes the yield but the lower the percentage of nicotine. The experiments last year failed to show any difference in nicotine content, whilst the close-planted plot (3 feet by 1½ feet) gave the heaviest crop.

Shelter.—The question of shelter is a very important one. Only land which is naturally well sheltered from wind should be selected for the growing of tobacco. A single stormy night may do an immense amount of damage to the crop unless it is well protected. Where natural wind breaks cannot be obtained, artificial ones, such as hop lewing or a belt of some tall luxuriant plants, *e.g.*, Kentucky hemp, artichokes, climbing haricot beans, or Ne Plus Ultra peas, must be used.

Weeding.—The land must be kept scrupulously clean in the early stages of growth, because by the middle of July the leaves of the plants will begin to overlap, making horse-hoeing impossible, whilst even hand-hoeing will have to be abandoned about a month later. All weeds must therefore be removed while the plants are still young.

Topping.—When the plants have developed about a dozen good leaves the whole top of the plant must be removed. This operation is known as "topping," and has for its object the prevention of seeding and the concentration of the entire energy of the plant into developing to the full those ten or twelve leaves that remain. Topping is nearly always carried out with smoking tobaccos, and it is found to be even more necessary where nicotine is the object in view. A few large well-grown leaves were found at Wye to contain 2½ times as much nicotine as a larger weight of small leaves left on another plant growing under the same conditions but left untopped.

The effect of breaking off the stem of the plant is to cause development of shoots in the axils of the remaining leaves. These are known as "suckers," and they have to be removed by hand as fast as they appear. In the case of smoking tobaccos suckering is done once a week from the time of topping to the time of harvesting, and probably it pays to do it just as often in the case of tobacco grown for nicotine extraction. The work can quite well be done by a boy, but it is nevertheless an expensive operation, costing about five shillings an acre every time it is done.

Harvesting.—By the beginning of September the plants should be ready for harvesting. It is very important not to cut too early as the nicotine content increases very rapidly

during the last week or two of growth. The ripening of the leaves can be told by a distinct change in colour from a dark to a lighter shade of green, but the exact time at which it is best to cut is still undecided. The nicotine content of some plants tested last summer increased by 1·5 per cent. during the last ten days they were on the ground, so that it would be better to cut the leaves when they are over ripe rather than harvest them too early.

There are two common methods of harvesting tobacco—the Single Leaf method and the Whole Plant method. The former method consists in picking the leaves off singly as they become ripe and threading them on strings to dry. The Whole Plant method consists in cutting the whole plant when the middle leaves are ready, and hanging it up bodily by the stem to dry without removing the leaves at all. The second method is considerably the cheaper one, and so was the one adopted at Wye last summer, the whole plant being cut down level with the ground. The best instrument for the purpose is a long-handled pair of pruning shears, but an ordinary wood chopper will do the work quite well.

Drying.—The plants should not be cut while dew is on the leaves, as they are then very brittle and a number will fall off. It is a good plan to leave them on the ground to wilt for a few hours after cutting, the leaves gradually becoming limp and then clinging better to the stem. The base of each stem is then attached by means of a piece of string to a pole, and a row of plants hung up to dry, either naturally in a barn or with the help of a stove. Self-binder string recovered from the threshing machine after being used the preceding summer for binding sheaves of corn, was found to be just the right length and texture for tying the plants to the poles.

Stripping.—As soon as the leaves are dry they may be stripped off the stems and stored away in a heap till the time comes when they are required for spraying. As stated above the best method of extraction is still being investigated, but soaking the cut-up leaves in water is quite effective in extracting the greater portion of the nicotine. It is certainly a simple way, and may be found to be the cheapest method, even though by the aid of chemicals a larger proportion of the nicotine may be extracted.

Cost per Acre.—The cost of growing an acre of tobacco as described above was estimated at £21 12*s*. 6*d*., but there are several ways in which the cost may be reduced. Harvesting and stripping the leaves alone cost over £5, and it is intended this year to try the effect of picking the leaves off the standing plants as they become ripe in the field, throwing them into a cart, and drying them with artificial heat on a hop oast. It was originally thought that a high temperature would cause a loss of some of the nicotine, and that air-drying the tobacco would be the most effective method, but it was found that there was no loss so long as the temperature did not exceed 130° F. Kiln drying is therefore being tried this year. The stalks of the plants contain a certain amount of nicotine as well as the leaves, but whether the small quantity contained in them is sufficient to justify the expense of harvesting, drying, and extracting is another question remaining to be investigated. It may perhaps be found possible to extract the nicotine without drying the stems.

Last season's results showed that an average yield may be expected of from 1,600 to 2,000 lb. dry tobacco leaves, excluding the stalks. Allowing 4 per cent. of nicotine, this works out at 64 lb. to 80 lb. nicotine per acre, or a cost of approximately 6s. per lb.

These figures, which do not include the cost of putting up wind-breaks or the cost of extraction, must be taken with some reserve. In the first place, it remains to be proved that it is possible to get all this nicotine out of the tobacco, and in the second place these figures are based on only one year's experiments, and it may be that a variety grown on a small plot will not average so well when grown on a large scale. The weather, however, last year was unusually cold, and with more sun and a higher temperature a higher percentage of nicotine might be expected.

Another point which must be borne in mind is the difficulty arising from growing the crop under Excise supervision. The restrictions imposed, even if they do not involve actual expense, are undoubtedly troublesome to a small

FORESTRY IN NORWAY.

S. BURTT MEYER.

THE natural inaccessibility of her interior and the sparseness of her population have handicapped Norway in commercial competition, but, locked up in a thousand valleys, lies her capital, the forests of spruce and pine. Time was when the great trees fringed her coasts and spread to the snow-line of her mountains, but now wide tracts have been cleared, and almost every hillside bears the mark of the woodman's axe.

The first mention of trade in timber comes from the 12th century, while a century later an export trade with Holland was flourishing. Up to about the year 1500, when the first saw-mill was established, all timber was split into the required dimensions, but with the new machinery came a marked increase in trade. After the Great Fire of 1666 London imported large quantities of Norwegian timber, although, two centuries earlier, Henry the Third is recorded to have purchased from Norway a ship-load of pine-panelling for the renovation of Windsor Castle.

With the growing demand, however, came a reckless indifference to the future; the grasping merchants of the Hanseatic League, who dominated Norwegian commerce for two centuries, burnt what they could not sell, baring the once green coastline; with the introduction of the steam-saw great havoc was wrought on the more accessible woods of the interior, and, crowning all, the modern demand for paper pulp has led to an alarming diminution in the supply. The drain of five centuries has not, however, impoverished the land beyond recovery, as some authorities would have us believe. There are still great tracts of fine timber land; there are even larger areas that, with scientific care, are gradually re-assuming their proper density of trees.

In attempting to describe the progress of scientific forestry in Norway it will be enough to sketch the growth and work of the Government Service, together with instances of private enterprise that call for attention.

The writer recently spent a year studying the forest life of Norway, and through the kindness of Herr Jelstrup, of the Bureau of Forestry, and Woods Managers Kiær and

Större of the Forest Service, saw examples of the work that is being carried on in widely separated districts.

The forest areas of Norway and the United Kingdom compare as follows:—*

	Norway.	*United Kingdom.*
Area under Forests ...	26,945 sq. miles	4,800 sq. miles
Percentage of Total Area	21·4 per cent.	3·9 per cent.

Of the total area of Norwegian forests about 17 million acres are productive, and of these the State owns 2 million acres and has partial control over 440,000 acres.

The annual output of timber from Norway can be shown to have increased annually for as many years as figures are available. In 1906 the production of unmanufactured timber was worth 2½ millions sterling, while manufactured timber and wood-pulp contributed 2 million pounds. The total for all classes showed an increase of over one million pounds on the figure for 1901; the rise being equally distributed between manufactured and unmanufactured timber.

Conditions of Forestry.—Of the forest trees of Norway the Scots Pine (*P. sylvestris*) is the most abundant. Next, perhaps, comes the Birch, and lastly the Spruce (*P. excelsa*). The Oak, Ash, Elm, and Beech are found in favoured places, while the Alder, Aspen, and Rowan are distributed pretty generally.† The two commercial timbers of the country are undoubtedly the Scots Pine and the Spruce, the latter having attained greater importance since the introduction of the paper pulp trade.‡ It is fortunate, therefore, that the natural habitat of the Spruce is at a lower altitude than the Pine, and, generally speaking, at a more southern latitude.

The Rev. T. B. Willson says: "The elevation has, of course, much to do with the growth of the trees; the snow-line in Norway being at about 4,000 feet, and getting lower the further north you go. In the country south of Trondhjem the Pine, as a rule, ceases at about 2,600 feet above the sea-level, where it is replaced by the Birch, which will grow up to about 3,500 feet; above that elevation only dwarf Birch and Willow will be found."

* According to Dr. Max Endre's *Handbuch der Forst Politik* and the Norwegian State Statistics. The *Bulletin of the International Institute of Agriculture* quotes: Norway, 26,723 sq. miles; United Kingdom, 4,850 sq. miles.

† Of the State woods, 69 per cent. are evergreen, 31 per cent. deciduous.

‡ In the manufacture of wood pulp or cellulose, Spruce is the staple timber used. About 15 per cent. of Pine can be added without causing deterioration in colour.

The finest forest land, chosen with regard to general accessibility and condition of growth, is probably that lying in the neighbourhood of the capital and extending north and north-east over the Glommen watershed.* The forests comprised in these areas are largely owned privately, and are the field of operation of some of the largest lumber companies in the country.

Forest Management.—Until quite recently the science of Forestry was but imperfectly understood by anyone but State officials; the great natural reproductive powers of the woods being entirely relied on to re-sow the land after felling. There is no doubt that this treatment has given remarkable results, provided that the thinnings have not been too heavy, but in many places, where the soil is poor and exposed, the stock is slow in re-asserting itself. The German method of clear cutting can hardly be said to exist in Norway.† The three systems in use at the present time are those known as Group, "Mother Tree," and Selection. The first, which consists of gradually clearing a circle until its diameter equals the height of the surrounding trees, works admirably; the second is used, where sufficient seed trees can be found, on the same principle as the Group, while the third lends itself particularly to the management of small and irregular woodlands.

Forest Operations.—The work of felling and removing the timber commences in the autumn and continues throughout the winter, being greatly facilitated by the snow which covers the ground from November until March or April. The checking and floating takes place when the thaw fills the rivers, and during the summer the timber is marked that is to be felled the following winter. It will be seen that forest operations differ seasonally in Norway and England. For example—at the time when transit is easiest in Norway, English forest roads are at their worst. The planting season, also, is restricted in Norway on account of the heavy annual snowfall.

Labour.—The necessary labour of the forests is recruited very largely from the class of small peasant proprietors

* The district referred to includes the amts or provinces of Akershus Hedemarken, Kristian and Buskerud. Church and State own 700 sq. miles, or about 1/20th of the total productive woodland in these provinces.

† Coast Erosion Commission, 2nd Report: Miller 23480—"There is no such thing as cutting down in Scandinavia on a large scale."

that is such a feature of the country.* These men live within easy reach of the woods, and, being bred to their work, are very reliable.

The wages paid are high compared to ordinary agricultural wages. A woodcutter now earns 2*s*. 10½*d*. a-day, compared with 2*s*. 0½*d*. in 1880; while a driver with a horse can earn half as much again. In the sawmills 2*s*. 11¾*d*., and in the timber yards 3*s*. 1*d*., are average daily wages.

State Forests.—As is the case in many other European countries, the Norwegian Crown Lands represent now only a part of what they have been. The best forests long ago passed into the hands of private individuals either at times of financial need or under the lax supervision with which they were formerly administered.

The institution of so-called rights of cutting and grazing has, in some parts, been allowed to grow to such an extent that at least 10 per cent. of the State forests yield no income, while from other large tracts only a trifling income is obtained. "Rights" are largely held by the peasant proprietors whose land adjoins the forests and include: limited right to fell "dry" or damaged timber and firewood; right to gather herbage, bedding material, cones, etc., and to graze animals, sometimes including goats (an extremely harmful privilege).

Another important point is the latitude and altitude. Over 57 per cent. of the State forests lie north of latitude 65°, and are, therefore, slow in yield. In the south a great proportion are at high altitudes and are much scattered. As an example of this, the Church woods, over which the State Department has control, have a total area of 163,000 acres and are split into 326 separate forests, each containing, on an average, 500 acres.†

Government Forest Service.—The first preparation towards setting in order the woods management of the country was made in 1737, but the present organisation dates from 1857, when a Bureau of Forestry with a Director at its head was

* Coast Erosion Commission, 2nd Report: Miller 23372—"Practically all the labour we get for the forests of Norway . . . is from small farms—small holdings."

† The Church woods are mostly in excellent condition and are not found difficult to manage. Witnesses before the British Royal Commission declared the management of similar areas difficult and costly.

established by Parliament. From that date up to the present time the Service has increased from a staff of two to upwards of five hundred men. The present staff ranges from the Chief of Bureau to the Divisional Guards (usually local landowners, paid a small annual fee for their services). The scale of pay is low, but it must be remembered that living is cheap in the country districts and that travelling expenses and about 5s. a day extra are allowed to all officers while on tour.

The Bureau is entrusted with the general management of the State woods and afforestation areas, including matters of law, finance, and valuation. Among other matters, it deals with the conservation of woodlands, and has power to deal with concessions granted to foreigners and companies. With the earliest mention of the timber trade in Norway we have records of timber export duties and the like, but little attempt was made to prevent overcutting. During the fifty years of its existence, the present Department has done valuable work defining the boundaries and peasant rights in the Government forests. The first measure of conservation was passed in 1892, forbidding any exportation of timber from the provinces in the extreme north for a period of three years. By a Law of 1893, since amended, the supervision of private forests was entrusted to the local Councils.

The damage done to woods by fire in former times was very extensive; the area destroyed during the last century being estimated at over 70 square miles. Effective legislation, which dates from 1893, has been greatly aided by the extension of road, rail, and telephone, by which means assistance is now quickly procured.

The financial position of the State Woods for the last fifty years may be briefly shown as follows:—

Profit on State Woods		£593,389
Value of Peasant Rights		381,944
Rise in Value—		
(a) Of Original Woods ...	£361,708	
(b) Of Purchased „ ...	79,246	
		£440,954
Total		£1,416,287
Less Cost of Improvement Schemes		21,673
Net Profit in Fifty Years ...		...£1,394,614

Afforestation.—The activity of the State as well as of private individuals as regards this question is largely due to the efforts of two societies—the Royal Society for the Welfare of Norway and the Norwegian Forestry Society. The latter receives an annual grant from the State and has branches all over the kingdom.

Although the actual work of afforestation has received most attention in the coast-line provinces, yet preparatory schemes of drainage and land-improvement are common in the interior, and planting has been widely carried on over the high-lying Crown lands of Eastern Norway. In connection with this it is interesting to note that the writer visited a large area on the Swedish frontier, covered with young *Pinus montana* at a height of 2,000 feet above sea-level. At 1,800 feet, seed of *P. sylvestris* sown the year before was germinating well, while at from 1,500 to 1,800 feet were many plantations of young pine and larch, all doing splendidly.*

At some places on the coast large sums have been spent in dealing with shifting sands. The process usually adopted is the same as that practised on the northern shores of Jylland in Denmark. Irregularities in the surface are first filled in; the ground is then covered with moss, heather, or any kind of loose material, pegged down in places; seed of *Elymus* or *Arundo arenaria* is sown, and, lastly, broad strips are planted with *Pinus maritima*.

The season for planting is restricted by the snowfall to early summer or early autumn. Sowing is found to be more successful in the interior than on the coastline, where the young seedlings are bared of snow while the weather is still cold.

The cost of planting may be reckoned at 22s. per acre, and the method used is generally either by holing with German planting irons or by planting in small mounds of good soil or turves distributed over the ground.

The task of determining the best varieties of trees for planting has been taken up by many private forest owners, as well

* Royal Commission Report: Mr. Forbes fixes the maximum planting altitude at 1,200 feet on the Pennine Chain; Sir H. Maxwell, at 1,000 feet in Scotland.

Quarterly Review, Jan., 1911: Mr. J. C. Medd writes—"In England over three million of the twelve million acres are 1,500 feet above sea level, and are therefore unsuitable for planting."

HECKING TIMBER ON THE GOVERNMENT FOREST RESERVE AT LAKE FOLMUND. LAT.

as by the Schools. One of the best examples of this is near Hamar, where Herr Kiær of the Forest Service is devoting 1,500 acres to experimental work and the training of students.

Planting by the State.—Although for many years the buying of land by the State for planting purposes had been advocated, it was not until 1873 that the experiment was made with 20 acres of glacial land, costing 18*s*. per acre. The area was gradually increased, until 2,500 acres had been obtained, at a total cost of £4,600.

The rise in price may be noticed from the fact that while in 1886 18*s*. per acre was paid for 150 acres, ten years later 275 acres of similar land cost over 30s. per acre.

Up to 1906 a total of 8,000 acres, lying mostly on the West Coast, had been purchased for planting purposes at a cost of £8,690. Included in this amount is the cost of 25 acres of nursery land, at £60 per acre. The price for planting land averages 18*s*. per acre. The estimated value of the whole area now is £13,240, showing an increase of £4,550. One area of 1,575 acres was purchased in 1904 for £1,110 (or 14*s*. per acre), and planted. It was valued in 1907 at £1,950, showing an increase in three years of £840 on the initial cost of the land.

Plant Nurseries.—In 1857 the State made their first grant toward the encouragement of tree planting. Seed was bought and sown, but the experiment hung fire, and not until five years later was any extensive sowing tried, under the direction of a nurseryman who had seen the work carried on in Jylland. Later, about 65,000 seedlings, both conifers and deciduous trees, were imported from Denmark and temporary nurseries were established. The deciduous trees did well under the new conditions, but the conifers suffered in transport.

About the same time, the State made another grant toward a planting scheme for the West Coast and the establishment of nurseries in convenient places. In connection with this, officers visited Denmark, North Germany, and Holland, and were so favourably impressed that the work was continued on an extensive scale, a nursery being established at Stavanger. The growth of the latter is shown by the fact

that, whereas the annual output at the beginning was 200,000 plants, in 1906 the number had increased to over two million plants. From each of the nine large nurseries now under State control, an average of 700,000 plants are sent out annually. Of these only a small percentage are deciduous.

Seed Stations.—The importance of procuring good seed was early recognised, and, although the first supplies were of necessity imported from Germany, it was found, particularly with regard to *P. sylvestris,* that home-grown coniferous seed was preferable. Consequently, a collecting station was erected at Vossevangen, at a cost of £175. Cones were bought from a variety of places along the coast, and a ready sale of guaranteed seed was found, extending even to foreign countries. The chief difficulty, however, lay in the unsteadiness of trade, due to the variability of seed years, and the consequent changing nature of the staff required.

The need for such work may be gauged by the fact that there are now four similar stations in working order, the finest being that at Hamar, which cost £300 to build and equip, and which, with a capacity for dealing with a thousand bushels of cones, has an annual output of over one ton of seed.

Planting by Communes and Societies.—The largest communal scheme in Norway is that at Trondhjem, where 4,500 acres of common land are being planted up. Grants have been made from the rates, and from the local Spirit Tax, and in 1896, 1,500 acres had been planted with 1,600,000 trees. The scheme has proved very educative in that many foreign, as well as indigenous, species have been used in the work.

The Bergen Afforestation Society has, since 1870, had a successful arrangement with several large landowners, whereby the Society undertakes planting, if the owner agrees to place future control in the hands of the Society, or, failing them, the State. The owner bears the cost of upkeep, fencing, etc., but receives all the profits.

Up to 1907 over a million young Spruce and Pine had been planted, and that the scheme has been successful is shown by the following results:—

On ¼ acre, at 25 years, there were 300 trees of 7 inch breast-high diameter, with a height of 24 to 36 feet. On another

$\frac{1}{4}$ acre, two years younger, there were 400 trees calipering 5 in. and from 24 to 30 feet high.

The work, in nearly all cases, has been under the supervision of the Government Service.

School Planting.—Before leaving the subject of planting, it is interesting to note the excellent work that is being carried on among schools in the country districts by the institution of planting-days and elementary instruction in the theory and practice of afforestation.

The Norwegian Forestry Society, who have, since 1890, received an extra grant toward this object, have made arrangements whereby the State provides the plants and gives the necessary training to schoolmasters who wish to interest the children in the movement. On one piece of parish land near the west coast, 100,000 plants have been put in by the school-children in three or four years, and are thriving well. The work is rapidly extending to country schools all over the land.

Forestry Education.—The first foresters received their training in Germany, particularly at the schools of Tharand, Aschaffenburg, and Giessen. Later, many took the course at the Forest Institute at Stockholm. By a Law of 1897, the Agricultural High School was founded at Aas, and a course in forestry was arranged. Students are entered for the course every other year, and the application for entrance has, from the beginning, far exceeded the accommodation. The rules stipulate that the applicant must be over 19 years old, with a certificate from one of the provincial schools showing efficiency in elementary forestry, and with a year's practical experience.

The High School course comprises one year's study of general scientific subjects and a second of specialised work. One year's additional practical work is arranged for students who intend entering the State Service. The subjects for the first year include: Rural Economy, Mathematics, Chemistry, Geology, Zoology, Botany, Physics, Book-keeping, and Theoretical Surveying. In the second year—Forest Management, Valuation and Law, Advanced Book-keeping, Practical Surveying, Levelling, and Map-making. For two months in the summer the second-year class live in the vicinity of

some large forest, where the practical work of Valuation and Surveying can be easily carried out. Early in the autumn the same class, accompanied by some of the Staff, make an *extensive tour of the country, with the object of seeing* all kinds and conditions of wood-land and woods-management. Half the cost of the tour is defrayed by the student.

An elementary Forest School was founded in 1876 at Kongsberg, with a forest officer at the head. Within the next ten years two other schools were started at Stenkjær and Elverum. The object of these schools was to offer a nine months' course in the theory and practice of forestry. It was intended to train annually twelve students, but the demand always exceeded the endowment.

The course at the schools was extended in 1905 to one year, in order that fuller instruction might be given in technical subjects. The number of students received annually was increased to 16, while the age limit was changed to 18–25 years. A plan was also completed whereby students, for eight months out of the twelve, were put under the direction of capable woodmen for their practical training. The number of men passed through the three schools since their beginning now exceeds 700.

Besides the above there are three County schools, partly supported by the State, while at nearly every Agricultural College instruction in forestry is included in the curriculum.

A SPANISH SYSTEM OF ESTATE MANAGEMENT.*

M. LE COMTE DE MONTORNÉS.

A PROBLEM *of supreme interest in connection with agriculture to-day* is without doubt the social agrarian problem which, at the present time, has become of vital importance in agriculture as well as in industry.

The establishment of perfect harmony between the landlord and the tenant is indeed one of the questions which ought to

* This Paper was read at the International Congress of Agriculture, Madrid, in May last.

be most carefully considered, and anything attempted in this direction is likely to be of utility with a view to the practical realisation of the great reforms needed in agricultural production and cultivation.

Numerous though the industrial population of the world may be, their number is small in comparison with the enormous population which lives exclusively by the cultivation of the soil. This long-suffering class is at least equally worthy of consideration and guidance in order to enable it to attain improvement and well-being.

Problems relating to agriculture are unquestionably of a very complex nature, and consequently difficult of successful solution, for in no other human science does theory differ so much from practice.

The steps which are being taken to encourage and maintain the system of small ownership, and to bring about the immediate or gradual conversion of the tenant into the owner, are certainly worthy of all consideration and praise; but, unfortunately, for several reasons, action in this direction cannot be taken everywhere, and, indeed, in many cases is not desirable. Moreover, in view of the slowness of the change, we must endeavour to find in existing conditions of ownership and rural labour means of immediately improving the position of the labourer, and of strengthening the ties which bind him to his landlord, and thus placing him in a position to abandon the routine unfortunately so common in the case of the mass of agricultural labourers of the whole world, so that, without the tenant leaving the soil which saw his birth, or the owner abandoning the fruit of the economy and labour of his ancestors, they may put into practice the splendid results of modern agricultural science, to the spread of which assemblies like our own contribute in such an important manner.

Far be it from me to pretend to offer a solution of this difficult question. It will be sufficient for me to present to you an account of an attempt which I have made, and which has happily given excellent results, in one of the most important districts from the point of view of agriculture in my own country.

The different systems generally in use for the cultivation

of the soil can be placed under three heads: (1) Direct cultivation by the owner himself by means of day-labourers paid a fixed wage or receiving a certain share of the profits. (2) Cultivation by the tenant, the latter paying over a part of the produce obtained: and (3) Cultivation by the tenant, the latter paying a fixed rent for the usufruct of the soil, whatever his system of cultivation may be.

My modest efforts have been directed towards a combination of these three systems, according to the nature of the land and the crops, by means of the direct intervention of the owner, facilitated and supported by this combination.

The first group is formed of fields where, by reason of a lack of rain, recourse has to be had to irrigation from rivers and springs, and of fields which the tenant devotes to the production of crops for his own use and that of his live stock, and for which he pays a fixed rent per acre. The second group comprises the larger areas under the regular crops, such as vines, olives, oranges, &c., the crops of which are gathered at regular periods. These, not being consumed by the farmer himself, are sold either immediately or after some preparation, and form the real source of profit. Finally the third group embraces the general work of the estate, and the work in connection with certain crops which are all paid for by the owner by means of fixed wages. The combination of these three systems on the same estate under certain special conditions has given very satisfactory results, combining the interests of the proprietor and the tenant, while allowing the former a continued and amicable intervention in the whole estate, an intervention which is well received by the tenant, and thus constituting a harmonious whole for the welfare and satisfaction of both.

On the estate referred to the tenant cultivates three or four acres of irrigated land, for which, together with his house, he has to pay a fixed annual rent. He also cultivates a larger area planted with vines, olives, and carobs (cereals are not cultivated in this part of Spain except on irrigated lands). The tenant occupies these lands on condition that he cultivates them according to certain fixed rules, to which he is obliged to conform absolutely, and also uses the ploughs and other implements furnished by the owner. The tenant must defray all expenses of cultivation and harvesting; the crops are

carried to the granaries of the owner, where they are carefully weighed in the presence of the tenant, who receives a receipt for his share, which is placed to his credit in the yearly settlement.

The tenants as well as the members of their families are employed at a fixed wage in periods in which there is little work, in improvements on the estate, in repairs to roads and buildings. This is arranged on a regular system, so that everyone has a share in this work. At the time of preparation of the produce, in this case the manufacture of wine and oil, there is enough work for all.

In the course of the year small sums are advanced to the tenants up to 30 per cent. of the average value of the share generally produced by the crops of the leased lands.

The tenant's profit is therefore made up as follows:—(1) Of the produce of the land held at a fixed rate less the rent; (2) of his share of the produce of the land which he holds co-operatively with the owner; and (3) of the wages he earns during the year for work on the estate and in connection with the crops.

He has then to his credit, in the balance at the end of the agricultural year, the produce of the leased lands and the wages which are due to him; and to his debit, the rent of his irrigated land and house, the advances which have been made to him, the total value of manures received for the irrigated land, and a part of the expenses of the manures used on the other cultivated lands.

If the final balance is in his favour it is paid to him at once; in the contrary case he is allowed three terms, which coincide with the periods of sale of his small crops and kitchen garden produce, of his fattening animals and other live stock.

It will be noticed that the owner obtains all the produce of the land (except that for which fixed rent is paid), that is, all the produce which is naturally of the greatest value; half of this being obtained by right as his share and half by purchase; the purchase price is fixed by mutual agreement between a representative of the owner and a representative of the tenants, according to the prices prevailing in the district at the time.

In this way the tenant is assured of a fair price and a sure

payment. At the same time the system avoids the fraud to which the system of sharing the crops lends itself when the tenant gathers his share. It allows the owner to deal with the whole of the produce of his estate, conduces to uniformity and efficiency of methods, and enables employment to be given to the tenants for a considerable length of time. All these circumstances justify the direct and continuous intervention of the owner in the cultivation, because it is on the condition of the produce that the result of its final preparation, and consequently the profit of his business, must depend.

The system undoubtedly necessitates the continued intervention of the owner, but this intervention requires him either to pay periodical visits to his estate or to reside there permanently. Those high in the social scale thus set an example to those below them of the much desired return to the land which has been so splendidly advocated in the writings of M. Meline. It also fosters the union of the tenant and the owner, by creating a community in which the former gradually recognises the advantage of the advice and modifications suggested by the latter with regard to cultivation, and accepts them with pleasure, even though he may sometimes have to abandon ancient practices. Facts show him clearly that the benefits do not go solely to the owner, but are for his own profit as well.

Supplementary to this, the owners might take an interest also in the religious, moral and physical welfare of their tenants by the provision of religious instruction and schools, by forming societies for providing against illness, and by instructive and recreative meetings, as is done on the estate under consideration. In such cases, it will be observed with satisfaction how cordial are the relations between the two classes, and how the discord between them insensibly vanishes. This system may quite possibly not be applicable everywhere, but surely in its essence it can be carried out in numerous districts in many countries, and although to bring it to a successful conclusion the owner must make certain material sacrifices, without these sacrifices no ideal can be realised. The greatest ideal of the moment is certainly that of putting into practice the numerous improvements that have been effected in agriculture by stimulating the inertia of the

mass of agricultural labour, and thus contributing to the moral and material peace of so important a class.

I could enter into greater details in support of this system, which, although open to objection on many grounds, when considered from the economic point of view may, in spite of all its defects and difficulties, give better results than many others already in operation. Even though it may not attain to the social end which we have in view, and of which we all recognise the urgency, it will avoid, or at least modify, the dangerous tendencies which are to-day rapidly spreading among the rural population.

By way of conclusion to this humble essay I would present to the Section the following conclusions:—

In the present state of the social agrarian problem we must seek, in order to retain the owner and the tenant on the land, a system of management in which the owner shall be directly interested in the produce of his estate, but in such a way that he shall not abandon the immediate and constant supervision of his land.

In the majority of cases this may be attained by grouping three systems now chiefly in operation, viz.: (1) Direct cultivation by the owner; (2) Cultivation by tenants in exchange for a share in the produce; (3) Payment of a fixed rent for the usufruct of certain lands to which the foregoing method is not applicable.

These three systems in combination on the same estate will give excellent results, and will conduce to perfect harmony between the two parties interested. Especially will this be the case if by means of equitable arrangements all the produce susceptible of further preparation can be transferred to the owner or to persons capable of dealing with it properly, with the exception of those crops which it is more convenient to grow on lands at a fixed rent, owing to their being immediately used by the tenant.

In addition, if the owners concern themselves, as they are bound to do, both by their interest and by moral obligation, in the religious, physical and moral welfare of their tenants, we should reach a condition which would be in harmony with present social needs, and prevent either owners or tenants from leaving the land.

Isle of Wight Bee Disease.

IN some of the outbreaks of this disease investigated the spores of *Nosema apis* have been found in enormous numbers in the cells lining parts of the alimentary canals of the affected bees. These cells become completely disorganised and eventually the spores escape from them and are voided in great numbers in the excrement. Such cases, which appear to be more frequently met with in the spring, are undoubtedly due to infection with this parasite.

In most of the outbreaks recently investigated few spores, if any, have been found, but parasites, which are probably young stages in the growth of *Nosema apis*, are usually present in the cells lining the intestinal tract.

It appears probable, therefore, that during the colder months, when the bees show little activity, the parasites grow and reach the spore stage before the bees succumb, while during the warmer months the rapid multiplication of the parasites often kills the bees before the spore stage is reached.

Experiments have proved that normal bees may be artificially so heavily infected that the intestinal cells are crowded with spores. Infection may be produced in various ways: (a) by feeding with spores, (b) by feeding with candy on which infected bees had fed, (c) by mixing naturally infected excrement with the food, (d) by confinement in a box in which infected bees had travelled, and (e) by contact with dead infected bees.

The investigations and experiments which have been made hitherto seem to indicate that the Isle of Wight disease is due to infection with *Nosema apis*, but that the symptoms of the disease and the growth of the parasite within the affected bees are greatly influenced by various conditions.

Slaughtering of Young Calves.

IT has frequently been represented to the Board of Agriculture and Fisheries that the scarcity of store cattle is due in no small measure to the excessive slaughtering of young calves. The matter is of so much importance that the Board think it desirable to publish the following copies of letters which have recently passed

between one of their correspondents and themselves on the subject.

Milfield, Alnwick,
Northumberland.
May 23, 1911.

SIR,—As one of the largest land agents in this county, and as one of your oldest surveyors, may I be permitted to call the attention of the Board to the scarcity, and consequent prohibitive price of store cattle.

At the present moment the live-weight price of good stores in this county ranges from about 42s. to nearly 50s. per cwt. A normal price, at this season, would be about 36s. or thereabouts, and at that price, feeders require to sell the fattened animal, in the following spring, at about the same price per cwt., namely, 36s. (net), in order to avoid loss. Beef is a shilling or two per cwt. above that figure at present, but not sufficiently far above it (even if the same price prevails next year) to justify the present price of stores, and feeders are therefore buying it at a level which means certain loss. They know this very well, but they cannot help themselves, they cannot get cattle cheaper.

Store prices have been gradually rising since 1905. The figures published by the Teviotdale Farmers' Club show this clearly. They are as follows:—

Year.	Yearlings. £ s. d.	Two-year olds. £ s. d.
1905	7 15 0	11 5 0
1906	8 0 0	11 15 0
1907	9 0 0	12 7 6
1908	9 12 6	13 10 0
1909	9 10 0	14 0 0
1910	10 0 0	14 10 0
1911	Not yet determined, but higher still.	

In five years the increase in price has been nearly 30 per cent., and the returns of 1911 will carry the level even beyond that figure.

The certainty of loss accruing to the feeders is not the only untoward circumstance which arises from this state of affairs. The sheep industry is certain to be affected, and that unfavourably. Summering cattle are absolutely necessary for keeping pastures in a condition suitable for sheep; the dearth of stores means that pastures are not being adequately stocked with cattle, and grazings will, in consequence, become unsuitable for sheep. This is an important point to keep in mind in considering the question.

From all points of view it is desirable that attention should be directed to this subject for the purpose of ascertaining whether anything can be done to remedy, or, at any rate, ameliorate, the existing state of affairs.

I do not advocate opening our ports to foreign store cattle, or to those from Canada or elsewhere. Apart from the question of disease, I do not think the number which would come in would materially affect the situation.

But we do not really need, in my opinion, to go abroad for our stores; we breed sufficient in the United Kingdom to serve all purposes, if the whole of those already bred were allowed to reach maturity.

According to the Agricultural Returns of 1910, there were in the United Kingdom in June, 1910, 4,342,186 cows and heifers in milk and in calf. Apart from barren animals and casualties these would produce:—

Within the twelve months, a calf a-piece	4,342,186
Allow for casualties 15 per cent.	651,327
We might expect to find under one year old ...	3,690,859
The Returns show of animals under one year ...	2,516,707
Shortage...	1,174,152

In other words, over a million calves are wasted each year, and if these, instead of being wasted, were allowed to live, our store stocks would be increased by 46 per cent.

I take it most of the animals forming the shortage are killed for veal.

It seems to me some attempt should be made to encourage the keeping of such calves instead of sending them to slaughter. We do not, I think, need even to save them all; if half were saved, it would probably suffice.

Great Britain is a worse offender in this respect than Ireland, for while in Great Britain 2,767,618 cows and heifers gave 1,396,952 yearlings—50 per cent., Ireland with 1,557,584 gave 1,110,986 yearlings—71 per cent.

If, therefore, the Irish standard could be reached in Great Britain, we would obtain half a million more stores per annum, and this would certainly relieve the situation very materially and probably meet the case entirely. What is done in Ireland might, I should imagine, be possible in Great Britain.

The question is what steps could be taken which would.

at the same time, be politic and practicable. I should not myself hesitate to prohibit the slaughtering of calves for sale as veal, but I of course recognise that any such proposal is out of the question, for various reasons which need not be specified.

But I think something might be done by the Board on voluntary lines:—

1. If the Board were to collect, from thoroughly reliable sources, in each county, correct data as to the prices of stores now prevailing, and to take steps to have the information so obtained widely disseminated in the proper quarters, those who now slaughter calves for sale as veal would doubtless be led to consider whether their interests would not be better served by putting their calves into the store market.

2. A system of co-operation might easily be arranged by Farmers' Unions and kindred societies, whereby those who want calves to rear would know where and how to get them at the times they required them. At present there is no such arrangement, and one district may be in the position of having to sacrifice calves for lack of demand, while other districts cannot get them for lack of supply. The principal Unions and Societies would, no doubt, give this matter their careful consideration if the question came before them from the Board of Agriculture.

3. The sentimental aspect is worth consideration. The slaughter of very immature animals, like calves a fortnight or three weeks old, is distinctly repugnant to many natures. The sight of these carcasses in butchers' windows is almost loathsome. The action of the late Queen in discouraging the killing of "lamb" had some effect for, at any rate, a time; a similar expression of feeling from an equally high quarter might, at present, have an important influence on the trade in veal. Whatever may be considered the best method of procedure, I think it cannot be denied that something needs to be done, and that as speedily as possible, and I call the Board's attention to the subject in the hope that some means may be devised whereby the hardships following the present scarcity of store cattle may be removed or relieved.

I am, etc.,

(Sd.) GEORGE GREY.

The Secretary,
Board of Agriculture.

To this letter the Board sent the following reply, dated 21st June, 1911 :—

SIR,—I am directed by the Board of Agriculture and Fisheries to advert to your letter of the 23rd ult., suggesting the adoption of measures with a view to remedying the alleged scarcity of store cattle in Great Britain, and in reply I am to say that the facts to which you have called attention are fully recognised by the Board. The excessive slaughter of calves appears to them to be due not so much to the extent of the public demand for veal, as to the inconvenience to the dairy farmer of maintaining and rearing calves when the object which he has in view is to increase his supply of milk for sale.

The Board agree that the dissemination of information as to the prevailing prices of store cattle is useful as a means of enabling the farmer to determine whether it is to his advantage to put his calves into the store market instead of slaughtering them, and this is one of the purposes which led the Board to publish a Weekly Return of Market Prices, compiled from data collected from a large number of markets in Great Britain. The Return is issued every Saturday and may be obtained direct or through any bookseller from Wyman & Sons, Fetter Lane, E.C., or Oliver & Boyd, Edinburgh, price 1*d*. A copy of the Return for the week ended the 15th inst. is enclosed for your acceptance.

As the production of milk for the sole purpose of sale increases, the difficulty experienced by the dairy farmer of finding a local purchaser for his calves who really wants them for rearing increases in like proportion, and the question as to what can be done to facilitate the easy and rapid transfer of young calves from the cow owner to farms adapted for their rearing without detriment to the condition of the animals, is a very important one. It is anticipated that some system of co-operation between farmers whereby this object could be achieved will form a fundamental part of any scheme for the improvement of cattle breeding, which may be framed by the Board under the Development and Road Improvement Funds Acts.

The difficulty of successfully feeding young calves with milk substitutes is a further cause of their being slaughtered. The rise in the demand for milk leaves much less for the calf

than formerly, and knowledge and experience are necessary to render feeding with substitutes a commercial success. The Board consider that the further facilities for agricultural education and demonstration, which will, they hope, be provided shortly, may be expected to provide further information on this subject.

A short article appeared in the Board's Journal for December, 1910, as to the practice of farmers with regard to the disposal of their calves, and an early opportunity will be taken of dealing more fully with the subject in the same publication. A leaflet on the subject of calf-rearing has been issued by the Board, and can be obtained at any time by persons interested in the matter, post free, on application to the Secretary, Board of Agriculture and Fisheries, 8, Whitehall Place, London, S.W.

I am, etc.,
(Sd.) T. H. ELLIOTT,
Secretary.

George Grey, Esq.,
Milfield,
Alnwick.

Human and Animal Tuberculosis.

THE Royal Commission appointed to inquire into the relations of Human and Animal Tuberculosis have recently issued their Final Report (Cd. 5761. Price *6d.*) which contains an account of the investigations carried out, and sets forth certain conclusions based on the results of the Commission's researches.

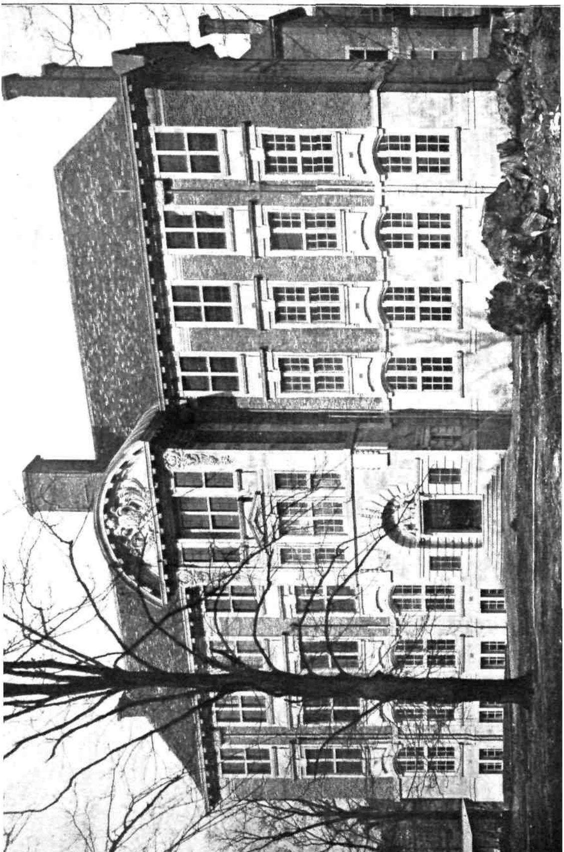
In regard to the question whether tuberculosis in animals and in man is one and the same disease, it is considered that on certain points there is room for difference of opinion, but that whether one prefers to regard bovine tuberculosis and the cases of tuberculosis in man which are caused by the human type of bacilli as varieties of the same disease or as independent diseases, there can be no question that human tuberculosis is in part identical with bovine tuberculosis. The researches of the Commission have proved that in a considerable proportion of cases of the human disease the lesions contain, and are caused by, bacilli

which are in every respect indistinguishable from the bacilli which are the cause of tuberculosis in cattle. In all such cases the disease therefore is the same disease as bovine tuberculosis.

They further conclude that mammals and man can be reciprocally infected with tuberculosis, and that a considerable amount of the tuberculosis of childhood is to be ascribed to infection with bacilli of the bovine type, transmitted to children in cow's milk. The danger to the adult human subject appears to be substantially less.

In the interests therefore of infants and children, and for the reasonable safeguarding of the public health generally, the Commissioners urge that existing regulations and supervision of milk production and meat preparation should not be relaxed; that on the contrary Government should cause to be enforced throughout the kingdom food regulations planned to afford better security against the infection of human beings through the medium of articles of diet derived from tuberculous animals.

More particularly, action in this sense is urged in order to avert or minimise the present danger arising from the consumption of infected milk. And in this connection it is pointed out that bovine tubercle bacilli are apt to be abundantly present in milk as sold to the public when there is tuberculous disease of the udder of the cow from which it was obtained. *This fact is generally recognised though not* adequately guarded against. But these bacilli may also be present in the milk of tuberculous cows presenting no evidence whatever of disease of the udder, even when examined post-mortem. Further, the milk of tuberculous cows not containing bacilli as it leaves the udder may, and frequently does, become infective by being contaminated with the fæces or uterine discharges of such diseased animal. Measures for securing the prevention of ingestion of living bovine tubercle bacilli with milk would greatly reduce the number of cases of abdominal and cervical gland tuberculosis in children, and such measures should include the exclusion from the food supply of the milk of the recognisably tuberculous cow, *irrespective of the site of the disease, whether in the udder* or in the internal organs.



SOME account of recent developments in agricultural education at Cambridge may prove of interest to readers of the JOURNAL.

School of Agriculture, Cambridge.

The first suggestion that agriculture should be included as one of the subjects of study in the University seems to have come from Mr. Henry Chaplin in 1890, when, in a letter written in his capacity as President of the Board of Agriculture to the late Duke of Devonshire as Chancellor of the University, he suggested the establishment of an Agricultural Department. A syndicate was appointed to consider the question, but the full recognition of the subject was not attained till 1899, when, with the help of the Worshipful Company of Drapers, a chair of Agriculture was permanently endowed.

The first occupant of the chair was Dr. William Somerville, during whose tenure of office, from August, 1899, to December, 1901, the Department obtained a farm for teaching and research. This was brought about by the generosity of Mr. W. A. Macfarlane Grieve, of Clare College, who leased to the University rent free for nine years, 140 acres of land at Impington, four miles from Cambridge. Dr. Somerville resigned to take office under the Board of Agriculture and Fisheries, and was followed by Mr. T. H. Middleton, who occupied the chair until 1907, when he, too, left Cambridge to take up the position of Assistant Secretary to the Board of Agriculture. Chiefly on the initiative of Professor Middleton, a scheme for the provision of a permanent home for the Agricultural Staff was taken in hand. The first aid in this direction was given by the Drapers' Company, who had already so generously endowed Agriculture. The Company offered to give £5,000 to a building fund provided that £5,000 could be raised elsewhere. The late Duke of Devonshire, then Chancellor of the University, assisted by a Committee of the Cambridge University Association, issued an appeal for funds, which brought in the necessary £5,000 by June, 1906. Before his Grace's last illness over £13,000 had been subscribed or conditionally promised. Subsequently, the present Duke became chairman of the Committee, and after nearly two years' continuous collecting, the fund was brought to the desired amount of £20,000.

Meanwhile the University had assigned an excellent site, plans were obtained from Mr. Arnold Mitchell, F.R.I.B.A., and the building shown in the accompanying illustrations is the result.

The building consists of three floors, a basement, and attics. In the *basement* are the heating apparatus, the store-rooms, a room for preparing samples for analysis, and a machinery room.

On the *ground floor* is the large lecture hall fitted with museum cases. This floor also contains the office and library, and private rooms for the Professor of Agriculture and the Lecturer in Agriculture. Also a third private room at present occupied by the Reader in Forestry.

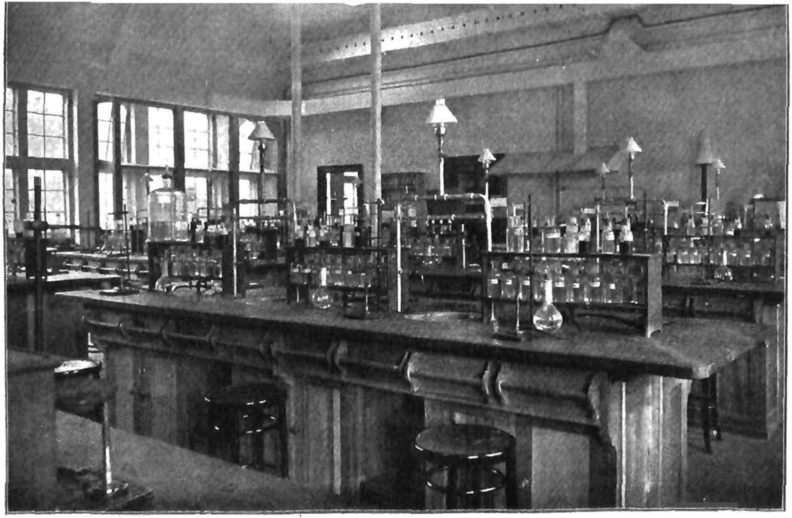
The first floor is devoted to the biological sciences as applied to agriculture. It contains a lecture room, elementary and advanced biological laboratories, and private rooms for the Professor of Agricultural Botany, the lecturers in Agricultural Physiology and Zoology, and the consulting zoologist and botanist of the Royal Agricultural Society of England, who are at present members of the Staff.

The second floor is designed for agricultural chemistry and physics, and contains a lecture room, a large elementary laboratory, an advanced laboratory, a balance room, a preparation room, and two private rooms for research.

The attic floor extends over the east half of the building and contains a greenhouse, a photographic dark room, and considerable storage space at present occupied by a collection of timbers which will be transferred ere long to a separate forestry building.

The building is designed to accommodate an elementary and an advanced class each of about 50 students. When the plans were made the total number of students of agriculture was only just over 40, but since then the numbers have more than doubled. The elementary class now contains over 50 students, and the advanced class over 30, and there are about 15 students on the books who only attend single classes. The teaching staff numbers ten, exclusive of the Reader and Lecturer in Forestry.

The Department has outgrown the Impington Farm, and now occupies a holding of about 230 acres belonging to Trinity and Clare Colleges, situated near the Observatory



School of Agriculture, Cambridge.—The Elementary Chemical Laboratory.

between the Madingley and Huntingdon Roads, and within little more than a mile of the laboratory.

The accommodation provided by the new building is taxed to the utmost, especially in regard to providing room for research work, of which the amount now being done is considerable.

The Chemical Department has been engaged, for the last three years, in an important investigation of the properties of the protein of linseed. It is expected that a method will be devised which will shorten in a very marked degree the time required for research of this nature. The routine methods of hydrolysis, esterification, and separation of the amino acids have required, in the case of linseed, nearly two years of continuous work. It is hoped that the new method, when perfected, will shorten the work of protein analysis very considerably. Investigations on the composition of mangolds have been going on for many years, and useful results have been published. Recent work has led to the separation from mangold roots of a non-protein nitrogenous body, which will be investigated with a view to ascertaining the part played by such bodies in nutrition. It would appear that the value of protein substances in feeding stuffs is influenced by the nature of the amides to which they are linked, as well as by the composition of their respective proteins. With this investigation Dr. Hopkins of the Physiology School will be associated. With the aid of the Development Fund, a new laboratory for experiments on the digestibility of foods is being erected on a site adjoining that of the Animal Institute on the outskirts of the town. The latter was, until recently, maintained by four of the Professors for the purpose of experiments on animals. It has now been acquired by the University with funds provided by the Development Commission. At the Institute, experiments are now being conducted in connection with tick-borne diseases of cattle, the effects of castration and spaying of pigs and sheep, the pigmentation of the fatty tissues in swine, and digestibility of foods.

A bee-house has been recently erected for the prosecution of research on the Isle of Wight bee disease.

Another problem under investigation in the Chemical

Department relates to the part played by the mucilage in linseed. It appears that this substance is not affected by the digestive juices, but under the action of bacteria is split up in the small intestine into substances which may be of use in the animal economy.

Investigations on the "strength" of flour are also going on. A rapid and accurate physical method of estimating the strength of flour has been discovered. Hitherto the only method was a baking test requiring a considerable quantity of flour for carrying it out. The new method is applicable to single grains of wheat.

Soil surveys of Norfolk, Hunts, and Salop have recently been completed, and await publication. Surveys of Cambridgeshire and the Isle of Ely are being undertaken. Four research students are engaged on this branch of the work.

In the Botany Department investigations are in progress on silver leaf disease. An investigation of the microflora of the soil of the Woburn experimental farm is in progress and tends to indicate that the effects of manures in altering the soil flora may be the primary cause of the observed variations in fertility.

Work is also being done on "Bigbud" in black currants, and, concurrently, investigations have begun with a view to ascertaining the extent to which individual plants are immune or resistant to insect attack. This inquiry has been suggested by the observed fact that the immunity to attack by American aphis varies considerably from one individual to another of the same variety. Certain bacterial diseases of the potato are also under investigation.

On the College farm the work on cereal breeding, for which the Department is so justly distinguished, is being continued. Two useful varieties of wheat, one rust-resistant and a prolific yielder, and the other a strong wheat combining the quality of Fife and the cropping capacity of the best English varieties, are now fully established on a field scale, and a beginning has been made in combining in one wheat the desirable qualities of these two. Small field plots of wheats suitable for the special conditions of the Fens will be harvested this year. It is hoped that experiments in breeding improved clovers will soon be under way.

School of Agriculture, Cambridge.—The Elementary Botanical Laboratory.

In the Physiological Department, also, much interesting work is being done. The experiments in spaying mentioned in connection with the Animal Institute are being conducted by this Department. The pigmentation of the fat of swine is also being investigated, a matter that is of great interest to the bacon industry. At the farm, an investigation on the body temperature of cattle is being conducted in collaboration with the Lecturer in Agriculture. This question has an important bearing on the use of the tuberculin test. An experiment on the crossing of Merino with Shropshire sheep, with a view to combining the wool of the first with the constitution of the second, is in progress.

The Biological Department of the University is engaged on a number of investigations on the breeding of poultry, the necessary accommodation having been provided on the University Farm.

It is probable that the energies of the Cambridge School as regards research will in the future be mainly directed to plant breeding, animal nutrition from the chemical as well as the physiological side, and animal breeding. It will be seen from the above account that considerable progress in connection with these subjects has already been made.

A Suggested Type of Agricultural School.

THE Rural Education Conference which was constituted by the Presidents of the Board of Agriculture and Fisheries and the Board of Education in June, 1910, have had under consideration for some time a reference from the two Boards "as to whether there is any place in the system of Rural Education either generally or in particular counties, in view of special local conditions, for schools giving to boys leaving Elementary Schools a three years' course from the age of 12 or 13 in the Theory and Practice of Agriculture, together with continued general education." This question was referred to a committee for detailed consideration, and the Conference have now presented a Report * on the subject. As regards boys who intend to get their living, at all events at the outset, as agricultural labourers, the report states:—"We understand that the type of school intended is one

* [Cd. 5774.] Messrs. Wyman & Sons. 3d.

where these boys will be given a suitable general education, in which the manual side will be fully developed, and theoretical and practical instruction in agriculture and its processes in order to make them more efficient labourers. We have come to the conclusion that there is at present no general demand for such schools, and that there is no place in the system of rural education for schools of this exact type being carried on continuously throughout the week."

Two main considerations influenced the Conference in coming to this conclusion. In the first place, the Report says, there appears to be a consensus of opinion among practical agriculturists that boys of this class who intend to live upon the land should get on to the land and into practical work on the land as soon as possible after leaving an Elementary School. In the second place, schools of the type contemplated in the reference would usually have to be boarding schools, to which the parents of boys of the labouring classes could only afford to contribute very low, if any, fees. Moreover, parents would have to forego the wages which their sons might otherwise earn.

As regards boys who intend to become farmers or small occupiers, the Conference are of opinion that different considerations attach, and that for them something beyond the ordinary Elementary School is required. In districts where Secondary Schools giving specialised rural instruction exist, and the fees and boarding charges are low enough to admit of the attendance of the sons of small farmers, the Conference consider that no further facilities for rural education for that class of boy up to the age of 16 can reasonably be required.

But, the Report points out, however much encouragement is given to the development of rural Secondary Schools, and to the improvement of rural instruction in the ordinary rural Elementary Schools, there is still room in certain districts for the trial by way of experiment of one or other of two new types of school.

One of the types, adapted to the instruction of future farmers, which the Conference suggest, would be akin to the present "Higher Elementary School" specialised in an agricultural direction. This type of school, which has not

hitherto been tried in England, appears to the Conference to give much more promise of success than schools professedly giving a large amount of instruction in practical agriculture, such as "fermes écoles," which have proved unsuccessful in France. The Report discusses the curriculum of these schools, which might be termed "Higher Grade Rural Schools," and recommends that, as regards the school fees, it might be left to the local authority to determine whether the instruction should be given free, or whether a moderate charge should be made to the ordinary pupil, with a fair provision of free scholarships. If these schools are to serve a large district, provision will have to be made out of public funds for boarding allowances and travelling expenses.

Another type of school which the Conference consider worth trying as an experiment is what the Report terms a "Centralised Rural Continuation Day School," to which boys actually engaged in work on the land between the ages of 12 and 16, or even 18, might be brought in several sets for one or two days a week. Such schools would serve areas (not exceeding a radius of 8 to 10 miles) which would vary in size according to the local conditions. They would usually consist of one or more rooms, well equipped for manual work, large enough to accommodate a class of not more than 20 boys under the charge of one specially trained master. While their general education would be continued, the students would also receive instruction in elementary science and rural economy with direct bearing on their actual employment.

The Mustard Beetle.

THE Board of Agriculture and Fisheries have received information that the Mustard Beetle (*Phædon betulæ*) is doing much damage in some districts this season. The Board would therefore direct attention to measures which may be adopted to combat this pest. The beetles hibernate in various shelter-places, *e.g.*, in the mustard stubble, in the hollow stems of other plants in the neighbourhood of the food plants, and in crevices of many kinds. Eggs are laid in spring and summer, and both grubs and beetles feed on the growing plants. Pupation of the grubs takes place in the soil. The mustard beetle may be attacked in five ways:—

(1) By shaking the beetles off the plants into troughs coated with tar, or into vessels containing paraffin.

(2) By dislodging and trapping the beetles by dragging tarred sacking just above or between the young plants when the beetles are observed on them. The strips of sacking must be light, in order not to injure the plants.

(3) By spraying the infested crop with arsenate of lead, which may be obtained ready for use in the paste form, and may be employed at the rate of 4 lb. of the paste to 100 gallons of water. It may also be prepared by dissolving 35 oz. pure or crystallized arsenate of soda in 50 gallons of water, dissolving 70 oz. acetate of lead in 50 gallons of water, and mixing the two solutions; or by dissolving 20 oz. dry, crude, or commercial arsenate of soda in 50 gallons of water, dissolving 70 oz. acetate of lead in 50 gallons of water, and mixing the two solutions.

(4) It has been observed that later in the year the beetles sometimes migrate in great numbers to other fields, and if this be noticed a shallow trench should be dug across the path of the migrating swarm; if the trench be kept tarred many beetles will be caught, notwithstanding the fact that they have wings.

(5) After an infestation the stubble may be burnt over before ploughing in order to destroy hibernating beetles.

An Example of the Introduction of Farmers' Telephones.

An interesting experiment in the direction of introducing into the rural districts of this country special "party" line telephones for the use of farmers and other rural residents, such as were described in the JOURNAL for July, 1911, p. 326, is being tried in the Brandsby district of Yorkshire. The annual rental for each telephone on such a line has been provisionally fixed at £3, with an unlimited local service during the ordinary official hours at the Post Office.

The Brandsby system has been in use since November last, and appears to be giving satisfaction to the subscribers, who have now the benefit, under certain conditions, of all the facilities afforded by the telephone system.

The telephones have been used to an appreciable extent for (*a*) local calls to other subscribers who rent exchange lines at the ordinary rates, (*b*) intercommunication among the party-line subscribers themselves, and (*c*) trunk calls.

It has been ascertained that trunk calls can be made satisfactorily to places within a distance of no less than 180 miles, although no calls have actually been made by subscribers for such places.

The experimental introduction of the system at Brandsby has been greatly facilitated by the enthusiastic support accorded to it by Mr. Hugh Fairfax Cholmeley, who has not only taken keen interest in the matter, but has also granted free wayleaves for the erection of a number of poles on his private property.

SUMMARY OF AGRICULTURAL EXPERIMENTS.

SOILS AND MANURING.

Manuring of Oats and Mangolds (*Experiments at Kineton, Warwickshire*, 1910).—These experiments have been carried out since 1901 by Mr. Ernest Parke, J.P., with the co-operation of Dr. Bernard Dyer.

When the farm was taken over it was in very poor condition, owing to long-continued neglect of manuring. The soil consists of heavy clay loam poor in available phosphoric acid, but indicating, on analysis, a sufficiency for the present of available potash. The experimental plots have been marked out from year to year in various parts of four different fields as convenience of cropping dictated.

In the case of the oats, the crop was spoilt by weather in 1909. In the other eight years the average crop with no manure was 38¾ bushels per acre; with 3 cwt. superphosphate per acre it was 49 bushels; 1 cwt. nitrate of soda in addition increased this to 56¾ bushels, and 2 cwt. nitrate of soda to 65 bushels. In the case of the mangolds the plant failed in 1906 and 1909, and only the average of the other seven years is considered. The crops were as follows:—

	tons	cwt.
No manure	17	16
4 cwt. super	24	10
4 cwt. ,, and 2 cwt. nitrate of soda ...	32	2
4 cwt. ,, ,, 4 cwt. ,, ...	38	0
4 cwt. ,, ,, 6 cwt. ,, ...	43	7

Dr. Bernard Dyer remarks that the experiments, which are being continued, appear to show that even land that has become through bad farming locally notorious for its poverty, may be possessed of sufficient inherent capability to yield abundant crops if treated with the proper fertilisers, and to give at the same time a good profit by their use.

Manuring of Grass Land (*Results of Grass-Manuring Experiments, Dr. Bernard Dyer and Mr. F. W. E. Shrivell*, 1910).—These experiments were carried out at eight stations in various parts of England and Wales. The general scheme is that one acre is set aside and divided into eight plots, which are manured annually with different dressings. The main crop is cut for hay, and the yield of each plot is given in the report.

Manuring of Grass Land (*Univ. Coll. of North Wales, Agric. Dept., Bull.* 3, 1910).—An experiment was carried out on a field at Quirt that

had been let for grazing for a number of years, and had been dressed with no other manure than basic slag. Various combinations of potash and phosphates were applied, but with no striking results on the weight of crop. A considerable effect was produced, however, on the quality of the herbage. Where no manure was used it was poor and full of weeds, containing little clover; but on the manured plots white clover was abundant, and there was some red clover.

Manuring for Milk (*Midland Agric. and Dairy Coll., Bull.* 1, 1910–11).—This experiment was begun in 1909 for the purpose of ascertaining whether superphosphate and sulphate of potash would give profitable returns on pasture land used for grazing cows for milk. A field in poor condition adjoining the college farm was taken, and two plots of four acres each were fenced in. The soil was of a strong, clayey nature, typical of most soils on the Keuper Marl formation. On account of indications of lack of lime, 10 cwt. per acre of ground lime was applied on both plots in the spring of 1909. On one plot 4 cwt. of superphosphate and 1½ cwt. of sulphate of potash were applied immediately afterwards, while to the other plot no manure other than the lime was given. No further manures were used in 1910. The effect was tested by comparing the milk yield of the cows. Two cows were grazed on each plot for a fortnight; they were then changed over, the two that had been on the no-manure plot going to the manured plot, and *vice versa*. This continued for five months, so that each lot of cows visited each plot five times. In order to allow the cows time to get accustomed to the different pasture, the milk of the second week of each fortnight only was taken into account, and the amount doubled to represent the fortnight's milk. By thus changing the cows from one plot to the other the effect of differences between the cows was minimised, and the only factor that would influence the result would be the manures applied.

Owing to the manured plot having much improved, a third cow was put on it on May 16th at the same time as the other cows, and kept on the same plot till the end of the season. In 1909 the third cow was introduced in July. During the five months the yield of the two cows while on the unmanured plot was 6,688 lb., and while on the manured plot 6,841 lb. The yield of the third cow on the latter plot was 3,392 lb., so that the total excess on the manured plot in 1910 was 3,545 lb., or 86 gallons, per acre. This confirms the result obtained in 1909, when an increase of 84 gallons per acre was obtained. The milk yield of the unmanured plot was 1,157 lb. more than in 1909, which would appear to indicate either an improvement of the pasture from the use of lime, or that it was a better grazing season, or perhaps a combination of the two causes.

Manuring of Seeds Hay (*Midland Agric. and Dairy Coll., Bull.* 2, 1910–11).—This trial has been carried out during four years at twenty centres altogether, in order to find whether seeds hay could be profitably manured, and if so, the best mixture for the purpose. Twelve plots of one-twentieth acre have been manured at each centre, care being taken to choose land as even as possible in character. Two plots were left unmanured, two received nitrogen and phosphates, and six complete dressings of varying composition. Taking the average of

208 lb. superphosphate, 200 lb. kainit; (2) 100 lb. sulphate of ammonia, 208 lb. superphosphate, 50 lb. muriate of potash. These both gave an increase of about 10 cwt. of hay over the unmanured plot, which, at £3 per ton, is calculated to leave a profit, apart from residual value, after allowing for the cost of the manures, of about 10*s*. per acre.

Manuring of Potatoes (*Midland Agric. and Dairy Coll., Bull.* 3, 1910–11).—A trial of the effect of artificial manures in addition to the usual farmyard manure was made at four centres in Lincolnshire and at the College farm. The conditions and soil varied somewhat, and at one centre no farmyard manure was used. The best yield was obtained from a mixture of 1½ cwt. sulphate of ammonia, 4 cwt. superphosphate, and 1½ cwt. sulphate of potash per acre, with from 12 to 20 tons of farmyard manure. This dressing cost 44*s*. per acre, and gave an average increase in crop over the plot without artificials of 32 cwt. of ware potatoes. Various other mixtures, including nitrate of lime, calcium cyanamide, fish meal, and some proprietary potato manures gave smaller increases for a similar cost of manure.

Manuring of Mangolds (*Midland Agric. and Dairy Coll., Bull.* 4, 1910–11).—In the course of preliminary trials extending over five years, a standard dressing of artificials for use with farmyard manure for mangolds was determined, and during three subsequent years this dressing has been further tested, and has given the best results. It is made up as follows:—Sulphate of ammonia, 100 lb., applied at seeding; nitrate of soda, 130 lb., at singling; superphosphate, 750 lb., at seeding; either sulphate or muriate of potash, 120 lb., at seeding; and common salt, 2½ cwt. applied in March. This was used in addition to from 10 to 25 tons per acre of farmyard manure. It cost 55*s*. 6*d*. per acre, and in any year always on the average gave a profit, the mangolds being valued at 12*s*. 6*d*. a ton.

Superphosphate or Mineral Phosphates for Swedes (*Midland Agric. and Dairy Coll., Bull.* 7, 1910–11).—It is commonly thought that soluble phosphates are desirable as being more available for the immediate requirements of the plant, but there is every reason to believe that soon after they are applied to the soil they combine with lime, and are more or less completely changed to the insoluble form. There are consequently good grounds for thinking that the practical value of soluble phosphates is due, not so much to their being taken up in that state by the plant, but to the solubility ensuring minute sub-division and even distribution throughout the soil particles. If fineness of division is the object in view, it was thought that an experiment could be usefully carried out to ascertain whether the same object could be obtained by reducing ordinary mineral phosphates to a fine powder, thus saving the cost of treating them with acid to form superphosphate. The experiment forms, therefore, a comparison between the mechanical and chemical preparation of phosphates. Nitrate of lime is also being tested, as well as the effect of ground lime, in order to see whether there is reason for the opinion that insoluble phosphates are more beneficial on soils lacking in lime and rich in organic matter.

This report contains the results which have been given by 500 lb. superphosphate, 173 lb. Florida phosphate, and 250 lb. Charleston phosphate, these amounts containing equal quantities of phosphate.

to show that the mineral phosphates are likely to be well worth attention in the problem of swede manuring.

LIVE STOCK.

Fecundity of Sheep (*Royal Agric. Coll., Cirencester, Scientific Bull. No.* 2, 1910).—It is generally held that, in the case of animals having usually one or two young at a birth, the disposition to bear twins is hereditary, and this work has for its object the investigation of the point in the case of sheep. In July, 1909, twelve pedigree Oxford Down twin theaves were purchased, six from mixed twins, and the other six from ewe twins. (In this report the three kinds of twins are spoken of as (1) ram twins, *i.e.*, both male; (2) ewe twins, *i.e.*, both female; (3) mixed twins, *i.e.*, one of each sex.) In the autumn these theaves were put to a pedigree Oxford Down ram twin, and lambs were dropped as follows:—

Lot I.—Mixed Twin Ewes ... ... (1 ewe died after lambing)	9 lambs from 6 ewes, including 2 pairs of mixed twins and 1 of ewe twins.
Lot II.—Ewe Twins	5 lambs from 5 ewes. No twins.

The next season, with the same ram and ewes, the results were:—

Lot I.—Mixed Twin Ewes	9 lambs from 5 ewes, including 3 pairs of mixed twins and 1 pair of ewe twins.
Lot II.—Ewe Twins	6 lambs from 6 ewes. No twins.

All the twins were borne by the ewes from mixed twins, and the ewe twins nearly all produced ram lambs. The experimental flock is too small, however, and the results so far obtained too few, to justify more than very tentative conclusions.

Breeding from Ewes at an Early Age (*Jour. South-Eastern Agric. Coll., No.* 19, 1910).—The object of this experiment is to find to what extent breeding from ewe tegs (*i.e.*, tupping at seven months instead of at one year and seven months) may be carried on without appreciably reducing the size, vigour, and constitution of the ewes. From the results in 1909 it was calculated that the production of a lamb in the first year entailed a loss of 5*s.* 8*d.* on the ewe, compared with those that were not bred from. In November, 1909, the same two lots of ewes were mated with a Southdown ram lamb, *i.e.*, both lots were twenty months old; one lot was mated for the second time, and the other lot for the first time. Forty-three ewes gave birth to fifty-four lambs, three ewes being barren. All the lambs did well, and there was no noticeable difference between those from the two lots of ewes. The weighing in 1910 took place on September 8th—seven weeks earlier than in the year before, as both lots were sold at the autumn sales. Owing to this there was an all-round decrease in weight compared with 1909, a decrease that is much greater in the case of the ewes that had only been bred from once, although these still remained ahead of the others in average weight. At this time (thirty months) the average live weight of the ewes that had had two lambs was 101 lb., and of those that had had one 110·7 lb. There was thus a difference, owing to the lamb in the first year, of 9·3 lb. At 4*d.* per lb. this would be worth 3*s.* 1*d.*, and the loss of 5*s.* 8*d.* in the first year was reduced to that

The spray generally used in Co. Louth, where these experiments were carried out, is Burgundy Mixture, or soda Bordeaux, made with 8 lb. sulphate of copper, 10 lb. washing soda, and 40 gallons of water. With this was compared the Woburn Bordeaux Paste, which is made according to the formula of Mr. Pickering, Director of the Woburn Experimental Fruit Farm. It contains about two-fifths the amount of copper sulphate in ordinary Bordeaux mixture, and no excess of lime, and was found by Mr. Pickering to be much more efficient than the ordinary kind. In addition, milk of lime Bordeaux mixture, containing 8 lb. sulphate of copper, 4 lb. quick lime, and 40 gallons of water, was compared with the above two mixtures.

In 1909 potato blight was not nearly so prevalent as usual, and the results of the experiments were not considered sufficiently conclusive. In 1910 the experiments were carried out at four centres, the soil being a light loam, or, in one case, a limestone loam. At all four centres two plots were tested with the Woburn Bordeaux Paste and the soda Bordeaux mixture respectively, while at three of the centres an unsprayed plot was added, and at two of the centres an additional plot was sprayed with milk of lime Bordeaux mixture. At three of the centres two sprayings were given, the first during the first week in July, and the second a fortnight later; at one centre only one spraying was given, viz., in the second week of July. All plots were sprayed at the rate of 120 gallons per acre of the respective mixture at each spraying.

The blight was very virulent in 1910. The Woburn Bordeaux Paste proved not nearly as efficient as soda or lime Bordeaux mixture, the haulms dying down much sooner, and the resulting growth of weeds being much greater on the plot sprayed with the paste. Lime Bordeaux mixture gave much the best results, but was only tested at two centres. The plots sprayed with the soda Bordeaux gave, on the average, 23 cwt. of saleable potatoes more, and 3 cwt. of diseased potatoes less per acre than the plots sprayed with Woburn paste.

Investigations on Potato Diseases (*Jour. Dept. of Agric. and Tech. Instruc. for Ireland, Vol. xi., No. 3, April,* 1911).—The Department of Agriculture for Ireland has established a temporary station at Clifden, Co. Galway, for investigating potato diseases, and this number of the Department's *Journal* contains a full report on the work done during 1910. A few points of interest to potato-growers in Great Britain are noticed here.

"*Stalk*" *or* "*Sclerotium Disease*" (*Sclerotinia sclerotiorum* Mass).—From observation of the position of the affected part on the plants, and from experiments, it is concluded here that plants can be infected directly by this disease, by means of air-borne spores, and that the intermediary action of the soil is not necessary. This is contrary to the opinion usually held, which is founded on some experiments by de Bary. The point is of practical importance, for if infection occurred only from the soil at the base of the plant, remedial measures would need to be applied to the plants at such places only, whereas if the infection is more or less general over the plant, the whole of it would require to be suitably protected. A number of methods of checking the disease were tried. These included dressing the soil with quick-lime and with Burgundy mixture, spraying the soil and the plants with Burgundy mixture, lime-washing the stalks, dusting the stalks with lime and sulphur, and spraying with liver of sulphur solution.

The results were disappointing, spraying with liver of sulphur four times during the season being the only treatment that seemed to have any effect in reducing the number of affected plants, and that but a slight one. The most striking results were from two plots where only one row of plants, 3 feet apart, was planted, instead of three rows, as on the other plots. This seems to show that there is far less chance of infection when the plants are well isolated than when they are crowded together, mutually shading each other, and having their stalks surrounded with more or less moist stagnant air. Such wide planting would not be practicable on a large scale, but less close planting than is sometimes seen may be desirable. A number of similar treatments were tried for Botrytis, which often accompanies *Sclerotinia*, but without any satisfactory result.

Black Stalk Rot (Bacillus melanogenes).—An organism has been isolated and proved to be the cause of this disease. It was shown that the organism is also capable of causing rot in turnips, swedes, carrots, and parsnips, but not in mangolds. Experimental proof of the infection of plants directly from the soil has not been obtained, and this is considered as showing that the soil of Ireland is not as yet much contaminated. The spread of the disease was shown to be mainly due to the unsuspected planting of infected seed potatoes. The danger of using apparently healthy tubers from a previously diseased crop as seed was demonstrated in a remarkable manner, no less than 94 per cent. of the plants derived from the seed succumbing to Black Stalk Rot. Great care should be taken in excluding all infected tubers from the pits, as it was proved that the bacillus can pass through the skin of a healthy tuber, in the absence of wounds, through the breathing pores. Cool, dry conditions prevent the rot from spreading to any degree, and such conditions should be established in making the pits. Affected plants should be removed from the crop and burnt.

Corky Scab (Spongospora subterranea Johns.).—Ten varieties of potatoes have been tested, but none have been found immune to the disease. Spore-balls of the organism would seem to pass unharmed through the digestive tract of a pig, and the manure of the animal may be a source of infection to a potato crop treated with it. The canker form of the disease was proved to be more infectious than the spot form. It was found that clean seed may become contaminated before planting by contact with diseased seed. Liming was definitely shown, both in 1909 and 1910, to increase the proportion of diseased tubers in the crop. Several methods of treatment of affected seed tubers resulted in a most satisfactory checking of the disease. These were soaking in formalin solution (1 :600) for three hours, soaking in copper sulphate solution (1 per cent.) for three hours, soaking in copper sulphate solution, as before, followed by rolling in slaked lime, soaking in and covering with precipitate of Burgundy mixture for three hours, and wetting the surface and rolling in flowers of sulphur. Where copper salts were used, however, the total yield of tubers was quite considerably reduced. The best yield was given with the formalin treatment, and the next best with sulphur.

None of the methods tried for disinfecting the soil were satisfactory. Lime, chloride of lime, and gas lime were found to increase the amount

Up to the present, the organism has not been found on any plant other than the potato.

Lime-Sulphur Wash (*Jour. South-Eastern Agric. Coll., Wye, No.* 19, 1910).—These investigations were undertaken by Mr. W. B. Burgess with a view to discovering (1) the best proportions of lime and sulphur for making the wash, and (2) the chemical changes which the wash undergoes when exposed to the air under conditions similar to those which obtain when the wash is used as a summer spray. The wash was considered only as a fungicide for use on the leaf in the summer.

The self-boiled lime-sulphur wash is usually recommended for summer use as it contains less sulphur in solution than one boiled over a fire, and is therefore less likely to injure the foliage. It is pointed out, however, that boiled washes can be diluted till they contain the same amount of sulphur as self-boiled, and a much larger volume is thus obtained from the same amount of sulphur.

The aim is stated to be to get the greatest possible quantity of sulphur into solution with the least possible quantity of lime. With this object small quantities of wash were made with five different proportions of the ingredients, ranging from 100 lb. lime, 100 lb. sulphur, and 100 gallons water, to 100 lb. lime, 300 lb. sulphur, and 100 gallons water, and analyses of each were made. The results obtained were insufficient for definite conclusions, but as far as could be judged the proportion of sulphur to lime should not exceed 2 : 1, and the most satisfactory formula appeared to be either 150 lb. or 200 lb. sulphur to 100 lb. of lime and 100 gallons of water. A wash with 200 lb. sulphur was made under practical conditions with ordinary commercial materials, and contained in solution 184·4 lb. of sulphur and 84 lb. of lime.

The changes in the fluid after spraying were investigated by exposing it in a thin layer on glass plates and examining the changes in chemical composition produced. Mr. Burgess concludes that lime-sulphur wash as a summer fungicide acts in two distinct ways—(1) as a contact spray, the polysulphides in the wash acting in a similar way to liver of sulphur; (2) as a protective coating to the leaves, due to the thin layer of sulphur in a fine state of division deposited from the thiosulphates and polysulphides by decomposition.

This sulphur would be much more efficient than flowers of sulphur for two reasons: (*a*) the former adheres very closely to the leaves, in fact, cannot be removed by the most drastic washing; thus a very great drawback in the use of flowers of sulphur is overcome. (*b*) Owing to its fine state of division, the deposited sulphur would oxidise more quickly than flowers of sulphur, and thus prove a more powerful fungicide, as its action probably depends on the formation of the sulphur dioxide.

It is probable that the chief value of lime sulphur wash lies in its use as a means of applying free sulphur to leaves.

As to the question of injury, the polysulphides are the most likely to damage the sprayed plant, as liver of sulphur where used too strong is known to cause severe leaf scorching. However, these compounds have been shown above to be very rapidly decomposed, so their injurious

on hop leaves showed that even with 20 per cent. solutions, only *insignificant injury was done just at the tip of the leaves.* This points to the fact that little injury is likely to come from this source. All possibility of injury would be removed by the first rain after spraying, as all soluble constituents of the wash would be washed off, leaving a layer of free sulphur with a little calcium sulphate or sulphite.

HORTICULTURE AND CIDER.

Pruning of Apple and Pear Bushes (*National Fruit and Cider Institute Report*, 1909).—The bushes on which the pruning experiments are being carried out were only laid out in 1905, and it is too soon yet to draw any definite conclusion. At present it appears that except for very strong-growing varieties, where root pruning is probably desirable to force a crop, and for very weak-growing varieties, where severe winter pruning may be required in the early stages to encourage good wood formation, the less the trees are pruned the better, when both growth and cropping qualities are considered. If this proves to be the case it will confirm the results of pruning experiments carried on under quite different conditions at the Woburn Experimental Fruit Station.

Use of Market Varieties of Apples for Cider (*National Fruit and Cider Inst., Report*, 1909).—Market varieties of apples are usually considered of little value for cider-making, but it has been suggested that more attention should be given to their use, as a means of utilising small, unsaleable fruit, and of avoiding a glut on the market. A number of market varieties grown in the Institute plantations have been analysed, and small-scale tests have been made to ascertain the type of cider produced. From the results it is seen that with very few exceptions the juice is poor in sugar and tannin, while the acidity is high. The rate of fermentation is excessively high for cider purposes. In the report it is stated that it is clear that the use of market fruit alone for cider-making in the usual way can only be extremely limited as regards the type of cider produced. The kind of beverage produced by ordinary methods will be a thin, dry cider, lacking in body and of marked acidity, probably possessing poor keeping qualities, and exceedingly liable to acetification. This has proved to be the case in the few instances where tests on a practical scale have been made at the Institute in past seasons. These tests have, however, shown that it is practicable by suitable treatment to produce a palatable and marketable beverage, even although it may not bear comparison with a cider made from true vintage fruit. There has been nothing in the flavour of these ciders to constitute any serious drawback, and indeed in one instance it was so good that a really delicate dry cider was produced by suitable blending.

There appear to be two directions in which satisfactory results may be expected. The first consists in the utilisation of a moderate quantity of true vintage fruit of the sweet and bitter-sweet types to blend with the market sorts. By mixing suitable proportions of each type it is possible to obtain a juice of fair average richness in saccharine matter

may even be possible in special cases to retain some natural sweetness by filtration, if the vintage sorts selected possess very slowly fermenting juices. The other course of action which may be adopted is to increase the original amount of saccharine matter in the juice by the addition of sugar in such quantity that, when completely fermented, the liquor will contain sufficient alcohol to restrain acetification. Such cider can then be stored long enough, without deterioration, for the excessive natural acidity to be gradually toned down and mellowed until it is no longer too pronounced. It may then be consumed as dry cider, or, if preferred, sweetened shortly before use with a further addition of sugar. A product of this type cannot be compared with a high-class natural cider, but it may be none the less palatable, wholesome, and saleable.

In districts where considerable quantities of apples are grown for market it is certainly worth while to devote more attention to the question of cider-making than has been given in the past, and to develop this means of profitably utilising surplus fruit. It would, however, be a mistake to regard market varieties as capable of supplanting vintage varieties for the production of the choicest types of cider.

OFFICIAL NOTICES AND CIRCULARS.

Advisory Council on Horse Breeding.

A meeting of the Advisory Council on Horse-Breeding, appointed by the President of the Board of Agriculture and Fisheries, was held on Thursday, July 6th, in a Committee-room of the House of Lords, under the Chairmanship of Lord Middleton. Among others present were H.R.H. Prince Christian of Schleswig-Holstein, K.G., the Duke of Portland, K.G., Viscount Helmsley, M.P., Hon. Alexander Parker, Col. Hon. Charles Byng, Sir Merrik Burrell, Bart., Major-General J. F. Brocklehurst, C.V.O., Mr. Algernon Turnor, C.B., Major A. L. Langman, C.M.G., Major W. H. Fife, Capt. John Gilmour, M.P., Mr. C. C. Hurst, Mr. J. L. Nickisson, Professor Penberthy, Mr. W. Phillpotts-Williams, Mr. R. S. Tilling, and Mr. R. Whitehead.

The Board were represented by Mr. A. W. Anstruther, C.B., an Assistant Secretary; Mr. S. Stockman, Chief Veterinary Officer; Mr. J. McI. McCall, Assistant Veterinary Officer; Mr. F. W. Carter, a Superintending Inspector; and Mr. E. B. Shine; and the War Office by Major Lathom Cox.

Mr. E. B. Wilson and Mr. A. B. Charlton, Joint Secretaries to the Council, were also present.

The Chairman submitted for the information of the Council a statement as to the references made to the Standing Committee by the Board, and the recommendations made by the Committee thereon, viz.:—

London Spring Show.—That the veterinary examination under the Board's Registration Scheme during the current year and prior to entry for the show should qualify a stallion for exhibition at the show.

That exhibitors be allowed to enter as many stallions as they like in a District Class, and that they be allowed to take all premiums awarded to them.

That every King's premium stallion should "travel," and not be allowed the option of "standing" in a district.

That the method of payment for "travelling" be altered from 10*s*. 6*d*. a service to an award of fifty guineas to be paid at the close of the season.

That no fee in excess of the prescribed fee be charged (unless the owner of the mare offers to pay it) for the service of half-bred mares located in the district for which the premium was awarded, unless and until seventy half-bred mares have been served, inclusive of mares purchased by a County Committee and mares in favour of which nominations for free service have been issued.

Registration of Stallions.—That the rules should contain a schedule of diseases and defects which should absolutely disqualify a stallion for registration, as follows: Cataract, ringbone, roaring, navicular disease, sidebone, shivering, whistling, bone spavin, stringhalt, and defective genital organs.

That the registration year be from November 1st to October 31st.

That the veterinary surgeon employed to examine a stallion should be required to report upon the *suitability* of the stallion for breeding purposes, as well as upon the soundness of the stallion, and be required to report fully as to any diseases or defects other than those scheduled which, in his opinion, render the stallion either unsound or unsuitable for breeding purposes.

Brood Mares.—That grants be allocated only to those counties where a Brood Mare Organisation existed, or where the necessary machinery could be put into motion without delay, and that the organisation of the scheme in such counties should be completed on a substantial basis before the scheme be extended to other counties.

On the motion of H.R.H. Prince Christian, seconded by Major-General J. F. Brocklehurst, the following resolution was unanimously adopted: "That this Council approve the recommendations made to the Board by the Standing Committee.

Mr. A. W. Anstruther, C.B., gave a summary of the operation of the Board's scheme since the last meeting of the Advisory Council. He expressed their obligations to Lord Middleton and the members of the Standing Committee for the help and advice given by them. They were also indebted to the County Committees and their secretaries, upon whose co-operation so much of the ultimate success of the scheme depended.

Considering the short notice that they were able to give in respect of the Spring Show, he considered the entries satisfactory, and he hoped the alteration of the rules referred to would conduce to more entries in the future.

The whole of the grant allotted for the purchase of brood mares had been allocated. This part of the Board's scheme had proved very popular. No difficulty had been experienced in purchasing mares and finding suitable custodians, and the mares seen by their inspectors appeared, on the whole, to have been judiciously chosen, and likely to make good brood mares.

Free nominations for service of mares by premium stallions had been well taken up, though it was hoped that in future years the ratio [of so]undness in the mares presented for service would be higher. The

average number of mares served by King's premium stallions was, on the whole, satisfactory, as for the first two months of the service season it was forty-three per stallion.

As regards the registration of stallions, the position was most encouraging, as with the promised co-operation of the breed societies and organisers of the principal Agricultural Shows they hoped to make the application of the scheme universal, the certificate of the Board to be accepted at all shows during the season. The number of stallions registered was 305, of which 102 were thoroughbreds.

For the mountain and moorland ponies the sum of £200 had been allocated this year with the assistance of the Polo and Riding Pony Society. It was not found possible to award premiums, but money had been distributed in prizes at selected shows in the respective districts.

Conferences would also be held with a view to elaborating a specific scheme for pony stallions and for pony mares, pack horses, &c.

He wished to impress upon those sending in schemes that he hoped, with the necessary funds, the Board would be able to carry on these subsidiary proposals side by side with the main scheme.

In response to the Chairman's invitation, various suggestions were made by members of the Advisory Council, and were referred to the Standing Committee for consideration.

Since the date of the above meeting the Board have decided to adopt and carry out the recommendations made to them by the Advisory Council.

The Board of Education issued the following circular to County *Education Authorities on July 14th*:—

Aid from the Development Fund for the Provision and Maintenance of Farm Institutes.

SIR,

1. I am to inform the Authority that the Treasury, upon the recommendation of the Development Commissioners, have decided to make an advance from the Development Fund to the Board of Education in order to enable the Board to make additional Grants in aid of the provision by County Education Authorities of Agricultural Education, in so far as that falls within the province assigned to the Board of Education by the Memorandum of Arrangements between the Board of Agriculture and Fisheries and the Board of Education, issued on the 22nd of September, 1909 (Cd. 4886 of 1909).

2. The Grants will be distributed under detailed Regulations which the Board hope to issue at an early date. They will be given, in accordance with the proposals made by the Board after consultation with representative members of County Education Authorities and in the light of the Report of the Rural Education Conference on County Staffs, and concurred in by the Development Commissioners and the Treasury, in aid of the provision by individual Counties or by combinations of Counties of County Staffs of Agricultural Instructors working from Farm Institutes as their headquarters. The several types of work within and without a Farm Institute which a County Staff might undertake in appropriate circumstances are described in detail in the enclosed Memorandum on the Principles and Methods of Rural

Education.* It is intended that a Farm Institute should serve as the headquarters for the miscellaneous and itinerant work of the Agricultural Staff, other than that done in regular local courses of instruction, and for educational demonstrations and similar purposes, and that it should also provide accommodation for central courses of instruction in agriculture and kindred subjects. These central courses might include, for example, (i) a 16 to 20 weeks' winter agricultural course for the sons of small farmers, who have acquired some practical experience on the land since leaving Elementary Schools, (ii) shorter courses in dairy work, poultry-keeping and the like during spring and summer, and (iii) vacation courses for teachers of rural subjects in local continuation courses. The buildings of an Institute should include (*a*) an educational block with class-rooms, laboratories for students and staff, dairy, poultry stores, carpenters' and smiths' shops, &c., and, where necessary, bee-keeping and fruit-preserving stores, (*b*) residential accommodation for the Principal, and (*c*) such other accommodation as may be desirable. Suitable equipment for the educational work will, of course, be necessary, and additional provision may in some cases be required for the institution of an Information Bureau and a Library in connection with the work of the Staff outside the Farm Institute.

3. Aid will be granted from the Development Fund towards both the provision and the maintenance of Farm Institutes. The grant in aid of the provision or enlargement of a Farm Institute will be limited to an amount not exceeding in any case 75 per cent. of the total approved cost of the provision or enlargement. The maintenance of a Farm Institute will be aided in two ways. The Authority providing the Farm Institute will receive grants under the Board's ordinary Regulations for Technical Schools, &c., in respect of the instruction given by the County Agricultural Staff in regular courses. To these will be added a contribution from the Development Fund in respect of the miscellaneous and itinerant work of the Staff, which will be so limited that the total Exchequer aid distributed by the Board shall not exceed 50 per cent. of the total approved cost of maintaining the Institute and its Staff. The small amount of aid at present given towards the miscellaneous and itinerant work of a County Staff under Article 34 of the Regulations for Technical Schools, &c., will be discontinued, and the Board's Grants, otherwise than out of the Development Fund, will in future be limited to regular courses of instruction.

4. On educational grounds the Board of Education regard it as essential for the successful working of a Farm Institute that there should be available and in close proximity to it a farm and garden. These will not only be required in connection with the internal courses of the Institute, but should also serve as an object-lesson to the farmers and gardeners of the country. In some cases a "small holding" for demonstration purposes may with advantage be added. The farm and garden should be conducted on business principles, so far as may be consistent with their primary use for educational purposes; but it is probable that such use will as a rule entail some annual deficiency upon a profit and loss account. Under the Memorandum of Arrangements

: obtained from Messrs. Wyman & Sons, Fetter Lane, E.C. Price, 3*d*.

between the two Boards it will be for the Board of Agriculture and Fisheries to distribute any State aid which may become available for the purposes of a farm and farm buildings. That Board will, it is understood, in fact seek an advance from the Development Fund for the purpose of enabling them to aid Local Education Authorities to equip and maintain farms in connection with Farm Institutes.

5. It will as a rule be desirable that the value of a Staff of Agricultural instructors should be fully recognised in a County before it is given permanent establishment in an Institute, and the Regulations will, therefore, make temporary provision for grants towards the maintenance of a Staff of Instructors, which has been appointed in advance of the provision of its permanent headquarters, as an initial step in the more complete organisation proposed for a County or a group of Counties.

6. The sums which will be advanced to the Board of Education up to March 31st, 1916, from the Development Fund for the purposes explained above will not exceed in all £325,000. It is understood that the Development Commission are not prepared to recommend the making of any other advances during this period for the purpose of aiding the provision of such branches of Agricultural education as fall within the province of the Board of Education. In these circumstances Local Education Authorities will doubtless recognise that no useful purpose will now be served by their undertaking the preparation of applications to the Treasury for direct advances from the Development Fund, and will instead make application to the Board of Education for aid towards Farm Institutes under the forthcoming Regulations.

7. In making grants under this scheme to Local Education Authorities, the Board of Education have undertaken to secure that the grants shall not have the effect of reducing the amount of any expenditure at present incurred by the Local Education Authority out of rates or other local resources upon work of the type to be aided, or the amount of any contribution made by the Authority out of such funds to the higher types of educational work conducted by Agricultural Colleges. It is also essential that only such Farm Institutes shall be provided and maintained by aid from the Development Fund as are really necessary, and in this connection the Board will give close consideration to the possibility and desirability of combination between Counties for the purpose. In view of the limitations placed upon the funds at the Board's disposal, it may be necessary to impose limitations upon the number and size of the Institutes to be aided in any individual County.

8. The detailed Regulations will be supplied to the Authority as soon as they can be prepared. Many points of detail in regard both to the substance and form of applications will require settlement and will need careful consideration, and the Authority should therefore defer for the present the completion of any scheme they may have it in contemplation to make, either alone or in conjunction with other Counties, as it will be impossible for the Board to deal with any applications relating to Farm Institutes or County Agricultural Staffs until the Regulations have [illegible]

The Board of Agriculture and Fisheries have received from the Development Commissioners the following statement respecting applications for advances from the Development Fund for the establishment of motor services in rural districts:—

Applications for Advances from the Development Fund for Motor Services in Rural Districts.

The attention of the Development Commissioners has recently been called to the question of assisting, by advances from the Development Fund, the establishment of motor services in rural districts.

They have adopted the following as conditions with which they think that all schemes for that purpose should comply before they can be recommended to the Treasury:—

(1) Application should be made only for an advance towards the initial capital expenditure necessary.

(2) The application should be for an advance by way of loan rather than by way of grant; rates of interest and terms of repayment will be fixed according to the circumstances of each case.

(3) A local contribution should be forthcoming of a reasonable proportion of the capital sum required.

(4) It should be shown that full provision is or will be made for putting in order (where necessary), and for maintaining the roads on which the service is to run.

(5) Proper provision should be made for maintaining the service, without recourse to the Development Fund.

A Conference, arranged by the President of the Board of Agriculture and Fisheries between delegates from the Berkshire and Adjoining Counties Dairy Farmers' Association and representatives of the Great Western Railway Company, took place at Reading on July 3rd with reference to the railway facilities afforded for the milk traffic in the area embraced by the Association.

Carriage of Milk by Rail.

Mr. J. Cornelius, of the Board of Agriculture and Fisheries, presided, and the following gentlemen were present: Mr. W. A. Mount, M.P., Mr. J. Lousley, Mr. T. Latham, Mr. F. Habgood, Mr. R. C. Nisbet, Mr. W. G. Clift, Mr. W. Farrant, Mr. A. E. Scutt, Mr. R. Pyke, and others, representing the Association; and Mr. J. Dunster, Mr. J. V. Williams, and Mr. H. J. Rule representing the railway company.

After discussion, the railway representatives promised that several of the questions raised by the Association should receive consideration.

No further outbreaks of Foot-and-Mouth Disease have been reported in Middlesex. The Board have caused very close inquiry to be made as to the origin of this outbreak, but have obtained no evidence throwing any light on the subject. The Board have made Orders withdrawing, as from the 8th inst., all the restrictions imposed by them on the movement

Foot-and-Mouth Disease in Middlesex and Sussex.

Mouth Disease in cows and calves at Road End Farm, Udimore, near Winchelsea, Sussex, and on the 18th disease was found on The Hammond's Farm, five sheep being affected, and also among some sheep at Float Farm, both being in the vicinity of the first-named outbreak. The existence of the disease was confirmed in each case, and the Board ordered the slaughter of the whole of the stock of these three farms, viz., 86 cattle, 2,300 sheep and lambs, and four swine; while as a matter of precaution 160 sheep which had been exposed to infection were also slaughtered. A large number of sheep outside the infected places were examined, but no evidence of disease was found.

The Board have made an Order, which came into operation on the 10th inst., modifying the restrictions in connection with these outbreaks. Restrictions will, from the date of the operation of the new Order, be in force only within a zone of approximately six miles of Udimore. No part of Kent is included in the Order.

MISCELLANEOUS NOTES.

Importation Regulations.

Importation of Potatoes into the Commonwealth of Australia.—By a Proclamation dated March 17th, 1911, under the Quarantine Act, 1908, the importation of potatoes from any country into the Commonwealth is prohibited unless :—

1. They are accompanied by an official certificate, dated and signed by a responsible officer of a Government Department of the country of origin, identifying the potatoes, specifying the quantity, and certifying—

(*a*) That at the date of the issue of the certificate they were free from the disease caused by *Phytophthora infestans* (known as Irish Blight), and from the disease *Chrysophlyctis endobiotica* (known as potato canker, black scab, warty disease, and cauliflower disease in potatoes);

(*b*) That they were grown in the country named;

(*c*) That they were grown at least twenty miles from any place known, after due investigation, to be or to have been within five years infected with either of the said diseases;

(*d*) That they were packed in the country of origin in clean, new packages.

2. The bags, crates, or other packages containing the potatoes are marked on the outside with the name of the country of origin and with other distinguishing mark or marks.

Sections 3 and 4 deal with the conditions to be fulfilled by the consignee on arrival of the potatoes in Australia, and provide for their being planted and cultivated in quarantine.

The above restrictions are relaxed in respect of potatoes imported for food.

Importation of Live Stock into South Africa.—The Diseases of Stock Act, 1911, of the Union of South Africa, repeals various laws of the several States of the Union and substitutes certain provisions, of which the following is a summary as regards the importation of animals

obtained from the principal veterinary officer. The latter, before granting the permit, must be satisfied that the country of origin is free from diseases to which the stock in question is liable, or, if not, that his requirements have been complied with; or, in the case of stock from any part of Africa outside the Union, that the stock itself is free from disease.

Imported animals are to be subject to isolation for at least thirty days. Cattle are subject to the tuberculin test, and animals reacting will be destroyed without compensation. Where any disease other than tuberculosis is suspected, such tests may be made as are prescribed by the regulations for the particular species of stock.

The veterinary officer at the port of entry may order the stock to be inoculated, dipped, disinfected, sprayed, branded, and muzzled or otherwise secured before the permit of the principal veterinary officer is issued. The expenses of such treatment, together with the cost of maintenance of the animals during isolation, must be borne by the owner. Stock which is infected or suspected of being infected, or which has been in contact with infected or suspected stock, may be destroyed, re-exported, or kept under such conditions as the principal veterinary officer may determine, the method adopted being left to the choice of the owner if this is made within seven days.

Inspection of Imported Potatoes in South Africa.—The South African Union Department of Agriculture has issued the following particulars as to the inspection of potatoes:—

Importers of seed and table potatoes and all others interested are requested to note that the Union Department of Agriculture has decided to inspect all potatoes introduced into the Union of South Africa from oversea at the port of entry. Inspectors will be stationed at Cape Town, Port Elizabeth, East London, and Durban, and every box or bag, as the case may be, will be opened and the contents examined. All rotting, diseased, fungus-infected, scabby, or insect- or worm-infested potatoes will be removed, and destroyed by fire without compensation to the owner.

Any lot of potatoes found to be infected with Black Scab or Warty Disease (*Synchytrium endobioticum* Percival) will be rejected entirely, and any lot found to be infected with a bacterial disease deemed to attack sound tubers will also be rejected if the infected potatoes are judged to constitute 5 per cent. or more of the consignment. Lots judged to be infected with such a bacterial disease to a less extent than 5 per cent. will probably be admitted for consumption, but not for sale as seed.

No consignment will be passed for admittance into the country unless (1) the consignee surrenders to the examining officer a declaration from the consignor showing the country and local place of origin of the potatoes, giving data that establish the identity of the consignment, and declaring that to his best knowledge and belief the fungous disease known as Black Scab or Warty Disease (*Synchytrium endobioticum* Percival) has never been known to occur on the farm or farms where the potatoes concerned were produced; and (2) unless the consignee, if called upon to do so by the examining officer, produces an

nine months previously that the department, shire, county, or other such territorial division in which are situated the place or places declared as being the source or sources where the potatoes were produced are deemed by the Government to be entirely free from the said disease. The examining officer may require that an attested copy of the Government certificate be surrendered to him with respect to any or all consignments. A certificate with respect to any place will be considered invalidated if the disease is recorded to be present there in a later-issued certificate or in an authoritative report. The official certificate required may be made as an endorsement on the consignor's declaration.

A minimum fee of 2½*d.* per case or bag will be charged for sorting, and a further charge of ½*d.* per case or bag will be made for every 1 per cent. or fraction of 1 per cent. of potatoes which it is found necessary to remove. Thus, if three cases in a hundred cases, or if four to five cases are condemned, the fee will be at the rate of 5*d.* per case.

Importers and others interested can obtain copies of the regulations when issued on application to the Acting Secretary for Agriculture, Pretoria, or the High Commissioner for the Union of South Africa, London. It is expected that the regulations will be in force in time to admit of their application to the first consignments of potatoes which will arrive from Europe in the present season.

Importation of Dogs into the Straits Settlements.—The *Federated Malay States Government Gazette,* of 26th May last, contains certain rules which have been published for general information relating to the importation of dogs into the Straits Settlements.

Under these rules, which amend the Quarantine Rules of 1908, it is provided that no person shall bring any dog into any Settlement either from another Settlement or from a place outside the Colony, unless a permit is first obtained from the veterinary officer of the Settlement into which the dog is to be brought, or from such officer as may be empowered to issue such permit.

In granting such permit, the veterinary officer may, in his discretion, impose such conditions as to observations as may be considered necessary, and may require the dog on landing to be detained in quarantine for a period not exceeding three months.—(*Board of Trade Journal,* July 13, 1911.)

Agricultural Congresses and Exhibitions Abroad.

Barley and Hop Exhibition at Chicago.—The second International Brewers' Congress and an International Barley and Hop Prize Exhibition will be held at Chicago from October 12th to 22nd next. The first Congress was held in connection with the Brussels Exhibition in 1910. The Congress will be divided into six sections for the discussion of the following questions connected with brewing: (1) Science of brewing (chemistry and biology); (2) Agriculture (barley and other cereals, and hops); (3) Practice of brewing and malting; (4) Materials (cereals, raw and prepared, and miscellaneous); (5) Engineering, refrigeration and fuel; (6) Economics (legislative, dietetic, and social). There will be an American exhibition of brewing machinery, materials,

stations demonstrating results in the cultivation of pedigree barleys and hops; educational exhibits, comprising collective exhibits of barley and hops for countries, states, or sections; brewing materials; scientific exhibits, comprising laboratory instruments and equipment, biological cultures, drawings, analytical methods, &c.

A subscription of $5 (£1 0s. 10d.) entitles to membership in the Congress and a report of the proceedings. This should be received by August 31st by the Secretary-General, 1508 Republic Building, Chicago.

The Congress will welcome delegates from the scientific institutions and trade organisations interested, and the sending of exhibits by such institutions and by growers of products that are suitable for the exhibition, as well as the attendance of individuals interested in the industry. Copies of the invitation to and rules of the Congress and the rules and regulations for the Barley and Hop Prize Exhibition can be seen at the Board's office.

International Congress and Exhibition of Apiculture.—H.M. Consul at Turin (Mr. J. H. Towsey) reports that an International Congress of Apiculture is to be held at Turin, under the patronage of the Italian Government, from 10th to 12th September. In connection with the Congress an International Exhibition of Apiculture will be held from 10th to 20th September. Applications for space should be sent to the offices of the Executive Committee of the Exhibition, 2 rue Po, Turin.

Copies of the programme of the Congress and Exhibition may be seen at the Commercial Intelligence Branch of the Board of Trade, 73 Basinghall Street, London, E.C., where also a few copies are available for distribution.—(*Board of Trade Journal*, July 13, 1911.)

Notes on the *Weather in July*.

During the *first* week, July 2–8, the weather was very fine over the whole of England, and little or no rain fell. In Scotland there was rain on several days, but by the end of the week the fine weather had extended there also. Warmth was "unusual," rainfall "light" or "very light," and sunshine "abundant" or "very abundant" almost everywhere.

In the *second* week the weather was very fine and dry generally, no rain being experienced except some slight falls in the north and west at the end of the week. Sunshine was "very abundant" in every district of Great Britain, and rain "very light" or "nought." Warmth was "unusual" everywhere except in England N.E. and E., where it was "moderate."

During the *third* week the conditions were still very fine over the greater part of England, but a little rain fell at times in the north-western and north-eastern counties and in North Wales. The warmth kept up, but sunshine was rather less than in the week before, and below the average in Scotland and the north-west and north-east of England.

During the *fourth* week the weather in England, although mostly fair to bright, was more variable than during the preceding week, while

Crop Conditions in Great Britain on August 1st.

The Reports furnished by the Crop Reporters of the Board on the agricultural conditions on the 1st August, especially refer to the effect upon the crops and live stock of the prolonged period of drought and heat. With the exception of wheat, of which the prospects have improved to an extent indicated by 2 per cent. on the probable yield, and of hops, which on the whole appear to have maintained their position, all crops have more or less deteriorated. The superiority of wheat over the other corn crops has increased during the month, and while in yield it will be the "crop of the year," reports as to its quality are also satisfactory. With the exception of North Wales and the West Midland division of England an average or over average yield may be expected in each division, with a result for the whole of the country of a crop some 3 per cent. above the average of the past ten years. Both barley and oats have suffered from the drought, the latter, in particular, being frequently described as thin and patchy. Both crops have ripened prematurely, and the grain is light. In none of the divisions of the country is the yield of barley expected to reach an average; while the results for oats are still less promising, the yield for the country as a whole being forecasted at 8 per cent. below average. All three cereals are short in the straw, and the harvesting of each is in progress throughout the country. Beans are also short in the haulm and have suffered considerably from attacks of "fly" as well as from the drought. They are now expected to be as much below the average as oats. Peas also have suffered from the lack of rain, and in some districts are reported to have dried up. The yield, which on the 1st of July was regarded as about average, is now anticipated to be 5 per cent. below it.

Potatoes are generally described as being in a healthy condition with a good growth, and marked freedom from disease. Reports show that early varieties have been lifting lightly, and the lack of rain will tend to diminish the weight of the main crop. In Wales and Scotland the yield promises to exceed the average, but in England an under average yield is predicted, and for the country, as a whole, the result will be about an average.

Roots have suffered from the long spell of dry weather, though mangolds have been less affected than turnips and swedes. Mangolds have made little progress and are generally backward, and the yield for all divisions of England and Wales is expected to be below the average. Turnips and swedes are frequently described as a poor plant, and backward, and are much in need of rain. In Scotland the early sown pieces are progressing more satisfactorily than the later sown.

The hay crop was secured in good condition, very quickly, and with little labour, the weather being for the most part favourable. The yields both for "seeds" hay and meadow hay are lighter than were anticipated a month ago. Both crops are now put slightly lower than a month ago, and the total supply will be considerably below average.

Reports on hops in the south-eastern division state that the bine is slack owing to the drought, and rain is needed. Vermin is not now generally prevalent, but the yield is not likely to reach an average. In the West Midland division reports are variable, and an average yield

All classes of fruit, and particularly orchard fruit, have suffered from the drought, which has caused a large proportion of apples, pears, plums, and cherries to fall from the trees. Strawberries were about an average crop, while the remaining crops both of small fruit and tree fruit are considerably under average.

Pastures have been very much burnt up by the heat, the scarcity of grass necessitating resort to oil cake and other feeding stuffs. Water has been very scarce in some districts, and stock have suffered in consequence. Where the water supply has been maintained stock have done fairly well, and crop reporters frequently express surprise that the condition of the herds and flocks has been so well kept up under such trying circumstances. There are frequent references to the reduced supply of milk, the result of which has been apparent in the Weekly Return of Market Prices. Summarising the reports and representing an average crop by 100, the appearance of the crops on the 1st August indicates yields for Great Britain which may be represented by the following percentages:—Wheat, 103; barley, 96; oats, 92; beans, 92; peas, 95; potatoes, 100; mangold, 97; "seeds" hay, 93; meadow hay, 89; hops, 98.

Notes on Crop Prospects Abroad.

The *Bulletin of Agricultural Statistics* for July, 1911, issued by the International Institute of Agriculture, gives the following forecast of the present cereal harvest from information received in time for publication on the 22nd July:—

Single Numerical Statement of the Production of the more important Cereal Crops in the Northern Hemisphere.—The area which has been harvested, or which is about to be harvested, of the four most important cereal crops—wheat, rye, barley, and oats—is now known for a number of countries in the Northern Hemisphere, and we are also able to give an approximate estimate of the probable production. Uniting these data in a common table and comparing them with last year's figures, we have the following results:—

Wheat.—The area has increased from 97,483,400 acres to 100,778,100 acres. The single numerical statement of the area, *i.e.*, the ratio, in percentage figures, between this year's area and the area last year, is 103·4.

The production has increased from 188,100,100 qrs. to 198,166,870 qrs. The single numerical statement of the production, *i.e.*, the ratio, in percentage figures, between this year's production and the proudction last year, is 105·4.

Rye.—The area has decreased from 6,585,960 acres to 6,559,800 acres. The single numerical statement of the area is 99·6.

The production has increased from 15,059,900 qrs. to 15,526,500 qrs. The single numerical statement of the production is 103·1.

Barley.—The area has increased from 9,674,100 acres to 9,863,300 acres. The single numerical statement of the area is 102·0.

[illegible]

The production has increased from 31,549,100 qrs. to 32,161,300 qrs. The single numerical statement of the production is 101·9.

In order to obtain an exact interpretation of these data, it should be borne in mind that—

The figures are only approximate. As revised figures are received at the Institute, these will always be included in the tables of the following month.

The figures for India and Tunis are the same as those published in the June *Bulletin*, no revisions having been received.

The figures of production for the other countries have come to hand during the past few days. With the exception of those for Belgium, Roumania and Denmark, the data have been furnished in absolute figures. The first two of these countries have supplied the figures of yield per acre, while Denmark has given the production in a percentage of the average production for the past ten years. In these three cases, therefore, the yield per acre and the percentage figures have been reduced to absolute figures.

Bulletin of Agricultural Statistics, Supplement, July, 1911.—This supplement contains revised figures for the estimated production of wheat in Italy and Roumania, and an estimate of the spring wheat crop in the United States. Taking these into account the total estimated production of spring and winter wheat in the following countries: Belgium, Denmark, Spain, Great Britain, Hungary including Croatia and Slavonia, Italy, Luxemburg, Roumania, Switzerland, United States, British India, Japan, and Tunis, amounts to 226,288,000 qrs., as compared with 216,964,356 qrs. last year.

The single numerical standard, *i.e.*, the ratio, in percentage figures, between the estimated production this year and the production obtained last year thus becomes 104·3, in place of the figure previously obtained and quoted on p. 434.

France.—The report of the Ministry of Agriculture on the state of the crops on July 1st gives the condition of winter wheat as good in thirty-five departments, and satisfactory in forty-eight departments. Spring wheat was good in twenty-five departments, satisfactory in thirty-six, moderate in one, and poor in one. In the case of the remaining departments, four for winter wheat and twenty-four for spring wheat, there was no information or the crop was not grown.—(*Journal Officiel*, July 21st, 1911.)

Hungary.—According to the report issued by the Hungarian Minister of Agriculture, dated July 25th, the estimated crop yields are as follows:—Wheat, 22,220,000 qrs.; rye, 5,980,000 qrs.; barley, 8,690,000 qrs.; oats, 9,340,000 qrs. The maize crop has suffered considerably, its growth having been arrested by the prolonged heat. These figures are slightly greater than the estimate of July 11th.—(*Dornbusch*, July 31st, 1911.)

Roumania.—The British Consul at Bucharest, Mr. Errol MacDonell in a dispatch, gives some information on the state of the local crops collected from an official publication dated the 30th June. Owing to the rains that fell at short intervals and the warm weather, all crops

It was feared, however, that the quality might suffer owing to the great heat subsequently. Autumn wheat, rye, and oats ripened in the last half of June. In the plains and towards the sea the crops were in good condition, with large ears full of heavy grain. Notwithstanding a small amount of damage caused by rain, wind, and some hail, a fine crop of wheat and barley is to be expected. The oat crop also was expected to give a very large production.

Maize was sown in the first decade of June in some districts, and owing to rain and cool weather growth was good, especially where the rain was plentiful. The second hoeing was nearly finished at the end of June, and in some districts the cob had already formed.

World's Hop Crop.—In their report, dated the 10th July, on the hop season 1910–11, Messrs. Barth & Son, of Nuremberg, state that the area under hops in the world in 1910 was 233,544 acres, against 240,634 acres in 1909, but that the production per acre was large; in fact, the firm regard it as one of the largest of the past thirty years. The quality of the crop suffered considerably from the cold wet weather during harvest time, and the drying of the hops was at times much impeded. Prices in Germany were very low at the beginning of the season, and have fluctuated considerably, but generally they have gradually advanced, until at present they are at their highest point. There is a great scarcity of stocks at the present time, and only a world's record crop will satisfy the demand. The 1911 plant has wintered well in all countries, and the general prospect is fairly good.

Russia.—A report in the official *Commercial and Industrial Gazette* of July 26th, forwarded by the British Commercial Attaché at St. Petersburg, sums up the prospects of the grain crops in Russia as follows:—In general, according to information received from all the sixty-three Bourse Committees, the grain crop in European and Asiatic Russia this year is an average one, considerably less than that of last year. The prospects are satisfactory for all grains in the west, south-west, and the south, and in places, especially in the governments of Ekaterinoslav, the Tavride, Kharkoff, and Kieff, very satisfactory. In the centre of the Empire the outlook is somewhat worse, though inclining towards an average yield. In the central and lower Volga, in the basins of the Kama and Bielaia, as also in the Ural region, it is already clear that the crop will be below the average, and in places even bad. In Siberia, with the exception of the government of Irkutsk, the Altai districts of the Tomsk government, and some separate districts of a few other governments, there is a complete failure of the grain and fodder crops. The reserves of grain this year are everywhere limited, and are considerably smaller than last year's.

United States.—The Crop Reporting Board of the United States Department of Agriculture estimates the yield of winter wheat at 455,000,000 bushels, as compared with a final estimate of 464,000,000 bushels last year. The average quality of the crop is put at 92·2, against 92·6 last year. The average condition of spring wheat on August 1st was 59·8, against 73·8 last month, 61·0 on August 1st, 1910, and 82·3 the ten-year average on August 1st. The average condition of the oat crop on August 1st was 65·7, against 68·8 last month, 81·5 on

70·0 on August 1st, 1910, and a ten-year average of 85·1.—(*Dornbusch*, August 9th, 1911.)

The Department of Agriculture has informed the International Institute that the estimated production of spring wheat in 1911 is equal to 105·8 per cent. of that of 1910. On this basis the Institute has calculated the probable production this year to be 244,751,000 bushels, compared with 231,334,000 bushels last year, and the production of all wheat 702,580,000 bushels, compared with 695,247,000 bushels last year.—(*Bulletin of Agricultural Statistics*, Supplement, August 1, 1911.)

Germany.—The German Imperial Statistical Bureau estimates the condition of the crops on August 1st as follows:—Winter wheat, 2·6; spring wheat, 3·0; winter rye, 2·6; spring rye, 2·7; barley, 2·5; oats, 2·9; potatoes, 3·0 (2=good, 3=average).

Canada.—*The Census and Statistics Monthly* for the month ended June 30th states that the condition of the field crops was then on the whole quite satisfactory. The condition of the crop, compared with the average yield in the last three years is as follows (100=average for 1908–10):—Winter wheat, 89; spring wheat, 112; barley, 107; oats, 107.

Prevalence of Animal Diseases on the Continent.

The following statement shows that, according to the information in the possession of the Board on August 1st, 1911, certain diseases of animals existed in the countries specified:—

Austria (*week ending July 12th*).

Anthrax, Blackleg, Swine-fever, Foot-and-Mouth Disease (7,952 Höfe), Glanders and Farcy.

Belgium (*fifteen days ending June 15th*).

Anthrax, Blackleg, Rabies, Foot-and-Mouth Disease (1,464 "foyers" in 289 "communes").

Bulgaria (*week ending July 14th*).

Anthrax, Glanders and Farcy, Rabies, Sheep-scab, Swine-fever, Swine Erysipelas, Foot-and-Mouth Disease.

Denmark (*month of June*).

Anthrax, Swine Erysipelas.

France (*month of June*).

Anthrax, Blackleg, Glanders and Farcy, Rabies, Sheep-pox, Sheep-scab, Swine Erysipelas, Swine-fever.

Foot-and-Mouth Disease (3,958 "étables" in 944 "communes").

Germany (*on June 30th*).

Glanders and Farcy, Swine-fever, Foot-and-Mouth Disease (20,793 infected places in 3,737 parishes).

Holland (*month of June*).

Anthrax, Foot-rot, Swine Erysipelas, Foot-and-Mouth Disease (18,241 outbreaks in 10 provinces).

Hungary (*on July 5th*).

Anthrax, Rabies, Swine Erysipelas, Swine-fever, Foot-and-M Disease (7,480 "cours").

Italy (*week ending June 12th*).

Anthrax, Glanders and Farcy, Rabies, Swine Erysipelas, S

Montenegro (sixteen days ending April 15th).

Foot-and-Mouth Disease (54 "étables" infected in 11 "communes").

Norway (month of June).

Anthrax, Blackleg.

Roumania (nine days ending July 13th).

Anthrax, Dourine, Glanders and Farcy, Pleuro-pneumonia, Rabies, Sheep-pox, Sheep-scab, Swine Erysipelas, Swine-fever.

Russia (month of March).

Anthrax, Cattle-plague, Glanders and Farcy, Pleuro-pneumonia, Rabies, Sheep-pox, Swine Erysipelas, Swine-fever, Foot-and-Mouth Disease (77,126 cases in 1,350 "communes").

Servia (eight days ending July 15th).

Anthrax, Rabies, Sheep-pox, Swine-fever, Foot-and-Mouth Disease (139 cases in 4 "arrondissements").

Spain (month of April).

Anthrax, Blackleg, Dourine, Rabies, Sheep-pox, Sheep-scab, Swine Erysipelas.

Sweden (month of June).

Anthrax, Blackleg, Swine-fever.

Switzerland (week ending July 23rd).

Anthrax, Blackleg, Swine Erysipelas, Foot-and-Mouth Disease (232 "étables" and 180 "alpages-pâturages" entailing 17,879 animals, of which 63 "étables" and 36 "alpages-pâturages" were declared during the week).

Agricultural Labour in England during July.

The Board of Agriculture and Fisheries have been furnished by the Board of Trade with the following report, based on returns from correspondents in various districts, on the demand for agricultural labour in July:—

Fine weather prevailed throughout July, and agricultural employment was consequently uninterrupted. Some day labourers, however, were short of work in the early part of the month, as the absence of rain checked the growth of the root crops and diminished the amount of hoeing to be done. The corn harvest began in several counties before the end of the month, and the crop stood up well, permitting the use of machinery wherever available. The supply of day labourers was usually sufficient for requirements.

Northern Counties.—The continuous dry weather somewhat hindered hoeing at the beginning of July owing to the backward state of the root crop, but there was a brisk demand for extra labour for haymaking. The supply of day labourers was, however, in general quite sufficient.

Midland Counties.—Haymaking commenced early; the crop, however, was rather light, and being also in good condition, hand labo[ur] was reduced to a minimum. In several districts the corn harvest follow[ed] on before the end of the month. There was a fair demand for da[y] labourers, which was, however, generally fully met by the supply. So[me] scarcity of men for permanent situations was reported in the Buckin[gham]

(Cheshire), Barrow *(Leicestershire)*, and Pershore *(Worcestershire)* rural districts.

Eastern Counties.—Employment was regular throughout the month. Day labourers were generally in good demand for hoeing roots and haymaking, although in some districts the supply was somewhat in excess of requirements.

Southern and South-Western Counties.—Owing to the dry weather the growth of weeds was checked, and consequently the root crops did not require so much hoeing as usual. The hay crop being light and easily cut, there was no great demand for extra labour, the supply in most cases being quite sufficient. Some scarcity of day labourers was, however, reported from the Wantage *(Berks)*, Wells *(Somerset)*, and West Penwith *(Cornwall)* rural districts. Men for permanent situations were in demand in the Chippenham and Devizes *(Wilts)*, Dursley *(Glos.)*, and Liskeard *(Cornwall)* rural districts.

THE CORN MARKETS IN JULY.

C. KAINS-JACKSON.

During the season just before harvest the weather is the leading influence, but it is seldom that all other influences are so completely eclipsed as they have been for the past thirty-one days. The forcing heat had brought the prospective date of new crop deliveries well forward by the end of the month, and thereby checked advancing tendencies; but the general opinion that production, while of over-average quality, would be lacking in bulk and quantity except in the case of wheat, made itself felt, and holders of grain at Lammas were confident of values both for old crops and new.

Wheat.—The statute markets during July seldom included a 33*s.* average from any leading centre for British wheat, while an average below 30*s.* was even more rare. Value, therefore, was unusually level for the old crop towards the close of the season. New wheat was offered at Mark Lane on the 31st, and 33*s.* to 34*s.* per 504 lb. was about the price; 1*s.* to 1*s.* 6*d.* above this would have been paid if the grower could have promised delivery before the Bank Holiday. At Norwich on the 29th rubbed-out samples were shown, and a price of 32*s.* for delivery to local mills on or before August 12th was obtained. The majority of farms, however, declined to "sell forward," and the tone of trade was quite firm. Prices ruling at the close of the month for imported produce were about as follows, the mean values on July 31st, 1910, being given, for the sake of comparison, in brackets. Best Russian, 36*s.* 6*d.* per 496 lb. (40*s.*); No. 1 Northern Manitoba, *none* (43*s.* 9*d.*); No. 2, 37*s.* 9*d.* per 480 lb. (43*s.*); Australian, 36*s.* per 480 lb. (40*s.*); Argentine, 35*s.* per 480 lb. (*none*); No. 2 White Calcutta, 34*s.* 9*d.* per 496 lb. (38*s.* 6*d.*), and Red Karachi, 33*s.* 9*d.* per 496 lb. (37*s.* 6*d.*). Durum was in fair supply a year ago at 37*s.* to 38*s.* per 480 lb., but is not now on offer.

Sales of British wheat for eleven months of the cereal year have been smaller than anticipated, but an unusually large quantity is believed to have been used on the farm, largely for poultry purposes. Imports for

shipping year ends July 31st. Returns of breadstuffs' exports (including flour as wheat) are not yet fully verified, but will probably show record totals, about 74 million quarters against 62½ millions last season. Russia and Europe S.E. have led the wheat export trade. Shipments of the month were 557,000 qrs. from North America, 789,000 qrs. from South America, 1,326,000 qrs. from India, 2,176,000 qrs. from Russia, 254,000 qrs. from Europe S.E., and 544,000 qrs. from Australia. The large Indian shipments were noticeable. The supply on passage on 31st was 2,910,000 qrs., a very ordinary total.

Flour.—Holders of flour have had a very unfavourable month. The weather has been against the condition of supplies in warehouse, and at the same time has been adverse to a good inquiry for bread. Thus bakers were buying less than usual in the identical weeks when millers had strongest reasons for effecting a clearance. That prices show little change, nothing, indeed, worth quoting, must be ascribed to the sustaining influence of the firm market for all sorts of wheat. The shipments of July were 395,000 sacks from North America and 15,000 sacks from Australia, both under-average quantities. The supply on passage on the 31st was 133,000 sacks—a very small total.

Barley.—The month closed with 380,000 qrs. on passage, including 145,000 qrs. Russian feeding, and 70,000 qrs. Californian brewing. Trade has been very inert, but the chief imported kinds have remained in strong hands. The shipping year witnessed specially large exports of this cereal from Russia and Roumania, and fair exports from California. The shipments of the month were 1,868,000 qrs. of feeding corn from Russia, and 147,000 qrs. from Europe S.E.

Oats.—The supply on passage remains considerable, but the hot weather is regarded as having been very exhausting for the growing crop, and holders have shown no haste to sell. Both Argentine and Russian cargoes on passage have, indeed, been held for an advance. On the 31st new winter oats at Mark Lane made 19*s.* to 19*s.* 6*d.* per qr. During the shipping year ended July 31st, Russia exported the colossal total of eleven million quarters, which exceeds by a million the world's shipment of oats for the year ended July 31st, 1909. For that ended July 31st, 1910, the total exports of all countries were 12½ millions. The shipments of the month were 212,000 qrs. from North America, 132,000 qrs. from South America, 867,000 qrs. from Russia, and 40,000 qrs. from Europe S.E.

Maize.—The month witnessed a remarkable development of market strength for this cereal, and the strength was further to be noted for its statistical and non-speculative basis. While imports, over six millions for the first seven months of 1911, are considerable, use has been large and stocks are less than usual. Meanwhile, the bids of 24*s.* to 26*s.* from Mark Lane per qr., and of 5*s.* 5*d.* to 5*s.* 7*d.* from Liverpool per cental, have quite failed to attract foreign holders, so that by the 31st the supply on passage to the United Kingdom had fallen to 380,000 qrs. against 865,000 qrs. on July 31st, 1910, and 955,000 qrs. on July 31st, 1909. As compared with a twelvemonth ago, Argentine was 1*s.* 6*d.* and African 2*s.* dearer, but American could be had for 26*s.* where a year back it was not on spot offer at all, and the chief round sorts at 25*s.* to 26*s.* were not dearer on the twelvemonth. The growing maize was regarded on the 31st as promising in S.E. Europe. Argentina did

not ship any yellow corn in the course of the month. The shipments of the month included 385,000 qrs. of flat corn from North America, very much below the quantity anticipated, 1,333,000 qrs. of round corn from Russia, and 1,313,000 qrs. of round corn from Europe S.E., both these latter items greatly exceeding expectation.

Oilseeds and Oilcake.—All sorts of oilcake are cheaper as compared with this time last year, and cottonseed cake has lately been attracting a larger sale than is usual for the season. Linseed and cottonseed remain dear without the quotations being anything very striking. Very little linseed is to be had under 70*s.* per qr. India has a good surplus of rapeseed, which is being very steadily exported, though the United Kingdom is, as usual, but a small buyer. Egyptian exports of cottonseed for eleven months of the cereal year are about 430,000 tons. Hull has bought more freely than any other port. Total shipments of linseed from all countries, January 1st–July 31st, were 3,200,000 qrs., against 3,801,000 qrs. last season, and 5,079,000 qrs. in the season before. July shipments of linseed were 127,000 qrs. from Argentina, 326,000 qrs. from India, and 50,000 qrs. from Russia. There were also small shipments from Morocco, Holland, and Turkey. The quantity of linseed on passage on 31st, 203,000 qrs., was a full average, but did not exceed it.

Various.—A month of great excitement has marked the trade in beet sugar. Crop reports week after week deepened in gravity from all the great producing regions, and at one time 13*s.* 6*d.* per cwt. (4*s.* 6*d.* above January) was obtainable. Opinion is not now quite so pessimistic, but a monthly review can indicate no precise values where a staple is fluctuating daily. Rice has been a strong market for the raw product, and the advance of 10*s.* to 15*s.* per ton in the by-products of the mill has caused increased sales, at 5*s.* per ton rise, of ricemeal and ricebran. Soy bean cake is a small supply and also a small inquiry just now. The market for soy beans has been dull, and prices favour buyers. Of soy beans there were on passage on July 31st about 52,000 tons. A large shipping trade was done in rye, August 1st–July 31st, over 5,200,000 qrs. being exported (mainly by Russia), against 2,600,000 qrs. in the previous shipping year. Very little has come to our shores, but the exceptional business is worth recording.

THE LIVE AND DEAD MEAT TRADE IN JULY.

A. T. MATTHEWS.

Fat Cattle.—The break in the long drought that occurred in June was only temporary, and the absence of rain and the great heat have added greatly to the graziers' troubles during July. Stores, purchased at very high prices, have had to be sold at very little more than cost. In seasons like the present, when the pastures are burnt up, it is inevitable that market prices must suffer from the number of immature animals sent forward to relieve the pressure on the food resources of the farm. Continued heat also diminishes the consumptive demand

The average prices for July are, however, no worse than those for June, and in the case of Herefords and Scots they were slightly better. They were as follows:—Shorthorns, 8*s.* 0½*d.*, 7*s.* 4½*d.*, and 6*s.* 4*d.*, against 8*s.* 0½*d.*, 7*s.* 4½*d.*, and 6*s.* 4*d.* per stone in June; Herefords, 8*s.* 3½*d.* and 7*s.* 7*d.*, against 8*s.* 2½*d.* and 7*s.* 7*d.*; Devons, 8*s.* 1½*d.* and 7*s.* 4*d.*, against 8*s.* 2*d.* and 7*s.* 5½*d.*; and Polled Scots, 8*s.* 4½*d.* and 8*s.* 0½*d.*, against 8*s.* 3½*d.* and 7*s.* 8½*d.* These figures refer to the average prices realised in about twenty English markets only. The trade in Scottish markets has been somewhat better than in the English. The Metropolitan market was closed on the 10th and 17th owing to the outbreak of foot-and-mouth disease at Hounslow.

Veal Calves.—There was a further decline in the average value of fat calves in about twenty-five of the principal British markets. It was only a fraction over 8*d.* and 7*d.* per lb. for first and second quality.

Fat Sheep.—The sheep trade cannot be said to have improved during July, but in the circumstances it could scarcely have been expected to do so, for the weather and conditions regarding green fodder crops have naturally affected the trade quite as severely as that for beef. In spite of this fact, however, actual values have been maintained, and there is little doubt that a change of weather would immediately strengthen the position of sellers and probably raise prices, at least to some extent.

The average values of Downs and Longwools were almost exactly the same as in June. Downs averaged 7½*d.* per lb. for first, 6½*d.* for second, and 5¼*d.* for third quality, and Longwools, 6½*d.*, 5¾*d.*, and 4¼*d.* The variation in prices at different markets noticed last month was again observable, and in the last week we find that while Downs were fetching 8*d.* per lb. at Newcastle, they were only worth 6¾*d.* at Hereford, Leeds, Shrewsbury, and Wakefield, a difference of about 6*s.* per head. While Islington market was closed there were over 3,000 sheep sent up for sale outside, and as the usual buyers in the suburban towns were debarred from purchasing, very poor prices were realised, sales being very difficult.

Fat Lambs.—The value of fat lambs has steadily fallen during the month at the rate of ¼*d.* per lb. per week, and the fall in the averages as compared with those of June was 1*d.* per lb. on first and ¾*d.* on second quality. The general averages in about forty British markets were a fraction over 9*d.* and 8¼*d.* respectively.

Fat Pigs.—There was very little change in the value of fat pigs, but prime small weights declined 1*d.* per 14 lb. on the monthly average. In about twenty-seven British markets, bacon pigs averaged 6*s.* 4½*d.* and 5*s.* 9½*d.* per stone for first and second quality. The average price of prime bacon pigs in July, 1910, was 8*s.* per stone. The pig "shortage" may therefore be considered as a thing of the past.

Carcass Beef—British.—In comparison with other classes of beef, Scotch sides have been in fair request, but the average price was scarcely so high as in June. Short sides of best quality have made from 6¾*d.* to 7*d.* per lb., and whole sides averaged 6¼*d.* and 6*d.* for first and second quality in the London market. English beef—almost a negligable quantity—averaged 5¾*d.* and 5¾*d.* for first and second quality.

[illegible] *Beef.*—There have been fair supplies of Deptford-killed

American beef, which have met a steady demand at 5¾*d.* per lb. for the best and 5½*d.* for second quality.

Chilled Beef.—United States chilled has been forward in such small quantities as to be scarcely worth quoting, but Argentina has kept the market more than well supplied. This article, unlike "hard" or frozen beef, has to be sold at what it will fetch, and the morning quotations have often during this month borne no relation to the prices accepted, perforce, later in the day. The highest price for best hindquarters was 4⅛*d.* per lb., and the lowest 3¼*d.*, while the value of forequarters has been an unknown quantity. On the last Wednesday they were quoted at 1⅞*d.* per lb.; and a few days previously a salesman offered to clear out at 1½*d.*, but the offer was refused, although the meat was sound.

Frozen Beef.—This article was held back, and transactions were almost nominal. Hindquarters were quoted at 2*s.* 2*d.* to 2*s.* 5*d.* per 8 lb. stone.

Carcass Mutton—Fresh Killed.—The average prices were: Scotch, 7*d.* and 6½*d.*; English, 6½*d.* and 5⅞*d.*; and Dutch, 6*d.* and 5⅝*d.* per lb. for first and second quality, in the London Central Market.

Carcass Lamb.—There were good supplies of Scottish lamb, which is now the most valuable, owing to its small size. All British lamb has sold very slowly at falling prices. It has ranged in London from 9½*d.* at the beginning to 7½*d.* at the end of the month, averaging 8*d.* and 7½*d.* per lb. for the first and second quality, but much has been sold at far less money. The finest New Zealand has fetched 5¼*d.* per lb.

Frozen Mutton.—Frozen mutton lost most of its recent advance, declining ½*d.* per lb. during the month. The best New Zealand averaged under 4*d.* per lb., and Argentine and Australian about 3½*d.*

Veal.—The trade was irregular. In the third week choice English fetched 8*d.* per lb., and the next only 7*d.* The average for the month was 7½*d.* for prime and 6⅝*d.* for second quality. Lower qualities sold at extremely low rates.

Pork.—A very small trade, but some business passing each week. Best English varied from 5½*d.* to 6*d.* per lb., and Dutch ½*d.* less.

THE PROVISION TRADE IN JULY.

HEDLEY STEVENS.

Bacon.—The month of July opened with business quiet; dealers had bought fairly heavily for the holidays, and consequently had their stocks to work upon. The continuance of the hot weather, although increasing the consumption, also caused dealers to keep their stocks as low as possible, in order to prevent the possibility of losses through depreciation of the quality of their holdings from the effects of the weather. Long sides fluctuated during the month, and the closing prices showed a slight fall. The fine summer weather experienced throughout July caused a good demand for all descriptions of hams, and although prices eased a little after the Coronation demand had

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Arrivals from some countries continue to show an increase over last year, but they are still below the average of recent years. The demand in America was good for all cured meats, that country having also experienced very hot weather. In consequence the prices asked for shipment were high, and importers considered them too dear to warrant their taking the risk of making purchases of any quantity for August and September shipments. During July the prices for American hogs fluctuated from \$6.15 to \$7.35, against \$8.20 to \$9.30 last year, and \$7.20 to \$8.25 two years ago. The quantities marketed continue to increase. The arrivals from Canada were only moderate, and prices kept steady until the end of the month, when they were a little easier.

English pigs were in moderate supply at about unchanged prices on the month.

Cheese.—The market during the past month was very puzzling to dealers generally. There was a fair consumptive demand, and the Canadian factorymen, being aware of the hot dry weather prevailing in this country, and consequent shrinkage in the make of cheese, have advanced their shipping prices, so that at the end of July as high as 60*s*. c.i.f. was asked for fancy Belleville section goods. This price is an unusually high one so early in the season for cheese made during the month of July.

The receipts of cheese into Montreal from May 1st to July 15th were 639,202 boxes, against 677,308 for the same period last year. The estimated stocks of Canadian cheese in this country on July 31st at the three principal distributing centres (London, Liverpool, and Bristol) were 214,000 boxes, against 274,000 at the same time last year, and 216,000 two years ago. The stock of New Zealand cheese was 2,600 crates in London and Bristol, against 8,500 last year. In the United States of America prices were around those current in Canada, and a few desirable lots were exported.

The dry weather has seriously curtailed the make of English cheese, more especially in the west, where there have been longer periods without rain. There was more marketed in Lancashire and Cheshire than in any of the other cheese-making districts, but the quality was irregular, and comparatively low prices were accepted in order to effect a clearance.

Butter.—There was a fair demand for this article, and with the continued dry weather prices increased from 5*s*. to 6*s*. per cwt. on the month.

Siberia is still experiencing very hot weather, and arrivals from that country were less. Australians moved steadily out of cold stores at advancing prices, the demand being mostly for best selections. New Zealands were in small supply. Shipments continued to arrive from Canada, but the quantities were not large, although in excess of the last two years. From May 1st to July 15th this year the quantity shipped to England and Scotland amounted to 25,198 packages, against 5,216 last year, and 2,454 in 1909. The shipping price at the end of the month was around 112*s*. c.i.f. United States butter wa[s] above an export basis. Irish butter advanced steadily on the mont[h]. On account of the hot weather the make shrunk considerably; t[he] shortage is variously estimated at from 30 to 50 per cent.

Eggs.—Prices are mostly easier on the month, brought about by the hot weather. To effect sales of some imported parcels (chiefly from Russia) affected by the heat, some very low prices have been accepted.

THE FRUIT AND VEGETABLE MARKETS IN JULY.

W. W. GLENNY.

Strawberries.—The drought materially hastened the strawberry crop, and fruit came to market hurriedly, which depressed prices on several occasions. The plants were parched, and late gatherings were of smaller size than usual. Large, well coloured parcels made 2*s.* 6*d.* to 3*s.* 6*d.* per peck. Quality and flavour were lacking in many instances owing to want of moisture.

Cherries.—Prices have been firm throughout the month. Imported consignments came from France first, and some were received from Belgium; but the liberal supplies that often arrive from Stade on the Elbe were lacking. Prices have varied from 14*s.* to 16*s.* per half-bushel for the best varieties of English produce, such as Early Rivers, Elton, Napoleon, &c., with lower figures for common kinds; while French and Flemish cherries were at various prices from 4*s.* 6*d.* to 10*s.* per half-bushel.

Apples.—A brisk demand has ruled for South Australian and Tasmanians in cases (40 lb. weight). Cox's Orange Pippins and Cleopatras sold for 14*s.* to 16*s.*, others, such as Worcester Pearmains, and Sturmer Pippins, averaged nearly 10*s.* per case, but were cheaper at the close of the month.

English Juliens, Suffields, Gladstones, Quarrendens, Beauty of Bath, Dominoes, Ecklinvilles, are now on sale at prices varying from 4*s.* 6*d.* per half-bushel for Ecklinvilles down to 1*s.* 9*d.* for Juliens, according to quality and size. Dessert and culinary apples began to arrive freely during the last week in July, though drought is having a serious effect in many orchards.

Currants have met with a good demand, which has encouraged importers to purchase both black and red; these come to market in trays of about 10 lb. net, and sell for from 2*s.* 6*d.* to 4*s.* per tray. Black currants are generally the dearer, and home-grown ones have fetched 7*s.* to 8*s.* a half-bushel, against 4*s.* to 5*s.* for fine red ones.

Grapes.—The price of grapes has been low. Best Muscats are worth from 2*s.* 6*d.* to 4*s.*, while Canon Hale are worth 5*s.* per lb. for those of quality and size.

Peaches and Nectarines.—These have been in request, more especially since the heat has prevailed. Goodwood made a special call for these luxuries, and they were sold for the occasion at capital prices; English peaches realised 12*s.* to 16*s.* per dozen; while nectarines were quoted at from 12*s.* to 28*s.* per dozen, according to condition.

Plums.—The French have sent some useful culinary plums of various qualities, the price averaging 5*s.* per half-bushel; while English Rivers, Orleans, and Royals have ranged from 4*s.* to 9*s.* per half-bushel, the

Greengages of the finest grade from Spain are well received at 1*s*. 6*d*. to 2*s*. 6*d*. for forty, packed neatly in small handy boxes. French 'gages in half-bushels realise between 6*s*. and 10*s*. each basket, while the same measure of Spaniards move between 10*s*. and 14*s*. per half-bushel, and are of fine quality and ripeness.

Gooseberries have met with a fair sale throughout the month at 2*s*. 6*d*. to 3*s*. per half-bushel, but they were cheaper towards the end of the month.

Raspberries have proved a short crop, and the jam makers have had to pay over 30*s*. per cwt. in many instances, while the general trade price has moved between 4*d*. and 8*d*. per lb., according to supply.

Tomatoes.—There is a demand for French tomatoes, as the home supply has fallen off a little. Best home-grown realise 3*s*. to 3*s*. 6*d*. per dozen lb., while Guernsey are a trifle cheaper.

Cucumbers.—Trade has been steady throughout the month, and fine, straight fruit has met with a ready sale at 2*s*. 6*d*. to 3*s*. per doz.

Marrows.—This commodity falls in value to a minimum when outdoor produce comes to market in van loads. Prices consequently fell from 3*s*. 6*d*. a dozen at the commencement of the month to a 1*s*. and 6*d*. a dozen at the close. Vegetable marrows are not available for pickle as cucumbers are, so when they are abundant there is a slump.

Beans.—Kidney dwarf beans are worth about 2*s*. 6*d*. per half-bushel, and scarlet runners which began at 6*s*. per bushel are now worth 3*s*. 6*d*. to 5*s*. Bloom drops off in drought, and scarlet runners in many fields have neither bloom nor fruit.

Peas.—These favourite vegetables have been far from plentiful under a scorching sun without moisture. Choice varieties like Duchess of Albany, Alderman, Autocrat, &c., have made 5*s*. and 6*s*. per bushel, while plainer varieties poorly podded have sold for 2*s*. per bushel the same day.

Potatoes.—The close of June finishes up the old-potato season for practical purposes, as markets are furnished with the new crop. July began with home-grown supplies from southern counties at from 4*s*. 6*d*. to 6*s*. 6*d*. per cwt., Channel Island at 5*s*. to 5*s*. 6*d*., French at 4*s*. to 5*s*., Canary at 9*s*. per cwt., Lisbon at about 4*s*. 3*d*. per box. The close of the month finds the trade rather easier, English best 5*s*., second quality 4*s*., Channel Island and French 3*s*. 9*d*. to 4*s*. per cwt. Imports from other sources have almost ceased.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of July, 1911.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	England.		Scotland.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK:—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle:—	s. d.	s. d.	s. d.	s. d.
Polled Scots	8 4	8 0	39 2	36 5
Herefords	8 4	7 7	—	—
Shorthorns	8 0	7 4	38 4	35 8
Devons	8 1	7 4	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	8	7¼	8¼	7
Sheep:—				
Downs	7¼	6¼	—	—
Longwools	6½	5¾	—	—
Cheviots	8	7¼	7¾	6¾
Blackfaced	7¾	7	7¼	6¼
Cross-breds	7¼	6¼	7¾	6¾
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs:—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	6 5	5 10	6 3	5 6
Porkers	6 10	6 4	6 7	5 6
LEAN STOCK:—	per head.	per head.	per head.	per head.
Milking Cows:—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	21 17	18 3	22 2	18 7
,, —Calvers... ...	21 19	18 0	19 2	16 11
Other Breeds—In Milk ...	19 15	17 11	19 12	16 1
,, —Calvers ...	15 10	13 15	19 3	15 17
Calves for Rearing	2 8	1 15	2 11	1 17
Store Cattle:—				
Shorthorns—Yearlings ...	9 14	8 6	9 17	8 18
,, —Two-year-olds...	14 2	11 16	14 0	11 17
,, —Three-year-olds	16 0	14 10	—	14 0
Polled Scots—Two-year-olds	—	—	14 5	14 2
Herefords— ,,	—	12 10	—	—
Devons— ,,	13 10	11 13	—	—
Store Sheep:—				
Hoggs, Hoggets, Tegs, and Lambs—	s. d.	s. d.	s. d.	s. d.
Downs or Longwools ...	31 6	23 7	—	—
Scotch Cross-breds ...	—	—	—	—
Store Pigs:—				
8 to 10 weeks old	18 5	14 3	19 9	16 3
12 to 16 weeks old	28 2	20 10	29 3	21 [illegible]

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of July, 1911.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	Quality.	Birmingham.	Liverpool.	London.	Manchester.	Edinburgh.	Glasgow.
		per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BEEF:—							
English	1st	54 0	—	53 6	55 0	58 6*	56 6*
	2nd	50 0	—	51 6	52 6	54 0*	53 6*
Cow and Bull ...	1st	46 6	45 0	45 6	48 0	48 6	47 0
	2nd	42 0	39 6	41 6	43 6	43 6	42 6
U.S.A. and Canadian:—							
Port Killed ...	1st	53 0	53 6	53 6	53 6	—	54 0
	2nd	49 6	49 6	51 0	52 0	—	52 0
Argentine Frozen—							
Hind Quarters...	1st	33 0	32 0	32 6	32 0	34 0	33 0
Fore ,, ...	1st	23 6	23 6	22 0	24 0	24 0	23 0
Argentine Chilled—							
Hind Quarters...	1st	36 6	38 0	36 0	38 0	38 6	39 0
Fore ,, ...	1st	24 0	24 0	21 6	24 6	24 6	25 0
Australian Frozen—							
Hind Quarters...	1st	32 6	31 6	32 6	31 6	—	32 0
Fore ,, ...	1st	23 6	21 6	22 0	22 0	—	22 6
VEAL:—							
British	1st	60 6	68 0	69 0	66 6	—	72 6
	2nd	52 6	63 0	59 6	62 0	—	65 6
Foreign	1st	—	—	67 6	—	69 0	65 6
MUTTON:—							
Scotch	1st	—	70 0	64 6	67 6	67 0	68 0
	2nd	—	65 6	60 6	63 0	59 0	57 0
English	1st	60 6	63 0	58 6	66 6	—	—
	2nd	52 0	56 6	53 0	60 0	—	—
Argentine Frozen ...	1st	36 0	35 6	33 6	35 6	36 0	34 6
Australian ,, ...	1st	35 0	34 0	32 6	34 0	—	32 0
New Zealand ,, ...	1st	—	—	36 6	—	—	36 0
LAMB:—							
British	1st	—	71 6	76 0	73 0	70 0	81 6
	2nd	71 0	65 6	70 0	67 6	58 6	71 0
New Zealand ...	1st	51 6	49 6	49 0	50 0	51 6	50 6
Australian	1st	46 6	44 6	43 6	44 6	—	43 6
Argentine	1st	45 6	44 6	—	44 6	—	43 6
PORK:—							
British	1st	56 0	62 6	54 0	63 0	53 6	57 6
	2nd	51 6	55 0	48 0	58 6	46 6	54 6
Foreign	1st	—	—	51 6	—	—	—

Average Prices of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1909, 1910 and 1911.

Weeks ended (*in* 1911).	Wheat.						Barley.						Oats.					
	1909.		1910.		1911.		1909.		1910.		1911.		1909.		1910.		1911.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
Jan. 7 ...	32	9	33	6	30	5	26	11	24	11	23	11	17	5	17	2	17	0
,, 14 ...	32	8	33	8	30	8	27	1	24	11	23	10	17	5	17	7	17	2
,, 21 ...	33	2	33	9	30	11	27	3	24	11	24	4	17	8	17	6	17	4
,, 28 ...	33	0	33	6	30	11	27	6	25	0	24	5	17	9	17	4	17	3
Feb. 4 ...	33	4	33	7	30	9	27	7	24	10	24	5	17	10	17	7	17	5
,, 11 ...	33	8	33	4	30	5	27	8	24	9	24	6	17	11	17	11	17	5
,, 18 ...	34	1	33	0	30	3	27	11	24	6	24	7	18	0	18	0	17	6
,, 25 ...	34	5	32	7	30	2	28	0	24	2	24	9	18	0	17	10	17	7
Mar. 4 ...	34	10	32	7	30	0	27	11	24	6	25	0	18	2	18	1	17	5
,, 11 ...	35	8	32	6	30	1	28	4	24	1	25	0	18	2	18	0	17	5
,, 18 ...	35	9	32	6	30	1	28	0	23	6	24	11	18	5	18	0	17	6
,, 25 ...	36	0	32	9	30	2	28	0	23	7	25	0	18	6	17	11	17	5
Apl. 1 ...	36	5	33	0	30	3	27	10	23	8	24	11	18	8	18	0	17	5
,, 8 ...	37	4	33	6	30	4	28	0	23	1	24	7	18	10	17	11	17	7
,, 15 ...	38	7	33	7	30	3	27	8	23	5	25	2	19	2	18	3	18	3
,, 22 ...	41	4	33	7	30	4	28	2	23	0	25	5	19	9	18	3	17	10
,, 29 ...	42	5	33	0	30	11	27	10	22	10	25	5	20	0	18	3	18	3
May 6 ...	40	9	32	6	31	4	27	7	22	7	25	7	20	3	18	2	18	6
,, 13 ...	41	6	32	1	31	8	27	3	22	0	25	1	20	6	18	1	19	0
,, 20 ...	42	8	31	10	32	6	27	0	21	8	25	4	20	11	17	8	19	2
,, 27 ...	42	6	31	3	32	8	26	3	21	4	25	0	21	0	17	10	19	5
June 3 ...	43	1	30	2	32	5	25	7	21	8	24	10	21	3	17	10	19	5
,, 10 ...	42	11	29	1	32	4	26	10	20	9	25	7	21	4	17	10	19	7
,, 17 ...	42	7	29	0	32	3	26	10	18	11	23	11	21	6	18	0	19	8
,, 24 ...	42	8	29	4	31	11	27	2	20	1	23	9	21	7	17	9	19	10
July 1 ...	42	9	29	9	31	10	27	2	19	11	24	5	21	9	17	7	19	9
,, 8 ...	43	0	30	4	32	1	26	4	19	5	25	10	21	8	17	4	19	9
,, 15 ...	43	3	31	1	32	3	26	10	21	3	25	10	21	9	17	7	19	11
,, 22 ...	44	0	31	11	32	5	27	4	19	9	24	3	22	5	17	5	19	5
,, 29 ...	43	5	33	5	32	5	24	6	20	10	23	8	22	2	18	1	19	7
Aug. 5 ...	44	9	33	9	32	0	27	4	20	5	24	4	22	11	18	3	18	2
,, 12 ...	44	9	33	5			24	9	20	4			21	8	18	0		
,, 19 ...	41	6	32	11			23	11	20	11			19	8	17	11		
,, 26 ...	38	5	32	7			24	7	20	10			19	4	17	2		
Sept. 2 ...	37	2	32	2			26	3	22	10			19	6	17	2		
,, 9 ...	34	11	31	11			26	1	23	3			18	5	17	2		
,, 16 ...	33	6	30	11			26	5	24	3			17	9	16	6		
,, 23 ...	32	9	30	2			26	8	24	2			17	7	16	3		
,, 30 ...	32	2	30	1			26	9	24	4			17	2	16	4		
Oct. 7 ...	31	8	30	1			26	9	24	7			17	0	16	3		
,, 14 ...	31	4	30	2			27	0	25	1			17	0	16	2		
,, 21 ...	31	8	30	4			27	7	25	3			16	11	16	1		
,, 28 ...	31	10	30	4			27	9	25	4			17	0	16	2		
Nov. 4 ...	32	5	30	4			27	9	25	6			17	0	16	2		
,, 11 ...	32	5	29	11			27	7	25	4			17	1	15	11		
,, 18 ...	32	7	29	8			27	0	25	1			17	4	16	1		
,, 25 ...	33	0	29	11			26	8	24	10			17	3	16	4		
Dec. 2 ...	33	3	30	6			26	1	24	7			17	4	16	7		
,, 9 ...	33	3	30	9			25	7	24	3			17	3	16	9		
,, 16 ...	33	2	30	7			25	3	23	9			17	4	16	10		
,, 23 ...	33	1	30	7			25	2	23	10			17	4	16	9		
,, 30 ...	33	3	30	5			25	1	23	9			17	4	16	9		

AVERAGE PRICES of **Wheat, Barley,** and **Oats** per Imperial Quarter in FRANCE, BELGIUM, and GERMANY, and at PARIS, BERLIN, and BRESLAU.

—		Wheat. 1910.	Wheat. 1911.	Barley. 1910.	Barley. 1911.	Oats. 1910.	Oats. 1911.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France:	June	41 10	46 8	25 5	27 4	21 4	22 9
	July	42 10	43 8	25 4	26 8	21 1	22 4
Paris:	June	42 6	47 2	24 4	27 0	20 6	23 11
	July	45 6	43 8	23 6	26 6	21 7	23 4
Belgium:	May	35 4	34 11	23 8	24 11	20 1	21 10
	June	31 11	34 10	22 8	27 4	19 8	21 10
Germany:	May	44 0	42 5	24 10	29 2	20 7	24 2
	June	40 5	42 7	24 3	28 8	20 1	25 0
Berlin:	May	46 1	44 4	—	—	20 10	23 2
	June	42 9	44 4	—	—	20 5	23 3
Breslau:	May	41 0	39 7	25 4* 23 3†	— * 24 9†	19 6	22 7
	June	39 7	40 5	25 4* 22 11†	— * 24 9†	19 3	22 10

* Brewing. † Other.

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the German quotations are taken from the *Deutscher Reichsanzeiger*, the prices for the German Empire representing the average of the prices at a number of markets.

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of July, 1910 and 1911.

—	Wheat. 1910.	Wheat. 1911.	Barley. 1910.	Barley. 1911.	Oats. 1910.	Oats. 1911.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London...	32 2	32 11	21 5	25 3	19 2	20 7
Norwich	30 9	32 1	18 4	—	16 10	19 6
Peterborough	31 0	31 6	19 2	—	17 2	18 5
Lincoln...	31 4	32 4	19 5	—	17 7	18 6
Doncaster	30 3	31 8	21 5	—	17 11	19 4
Salisbury	[illegible]	31 9	19 10	22 9	17 8	20 1

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certai MARKETS in ENGLAND and SCOTLAND in the Month c July, 1911.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	Bristol.		Liverpool.		London.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
BUTTER:—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb
British ...	14 0	13 0	—	—	13 0	12 0	14 0	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt
Irish Creamery	111 6	108 0	111 0	109 0	113 6	110 0	112 0	109 0
,, Factory	101 6	96 6	99 0	90 0	103 6	99 6	—	—
Danish ...	—	—	121 0	118 0	118 6	116 6	115 0	—
French ...	—	—	—	—	120 0	117 0	—	—
Russian ...	105 0	98 6	105 0	100 0	105 6	102 6	101 6	99 0
Canadian ...	112 6	109 6	111 6	109 6	—	—	111 6	—
Australian ...	106 0	103 6	—	—	108 6	105 0	—	—
CHEESE:—								
British—								
Cheddar ...	74 6	70 6	72 0	70 0	68 6	65 0	60 0	58 0
			120 lb.	120 lb.	120 lb.	120 lb.		
Cheshire ...	—	—	65 0	60 0	74 0	66 6	—	—
			per cwt.	per cwt.	per cwt.	per cwt.		
Canadian ...	57 6	56 0	58 6	56 6	59 6	58 0	58 0	—
BACON:—								
Irish	74 0	68 6	69 0	64 0	73 6	69 0	69 6	—
Canadian ...	65 6	63 0	64 0	60 6	65 6	63 6	—	—
HAMS:—								
Cumberland ...	—	—	—	—	106 0	98 0	—	—
Irish	—	—	—	—	106 0	99 6	102 6	99 6
American (long cut)	72 6	69 0	72 0	68 6	75 6	71 6	70 0	—
EGGS:—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120
British ...	10 0	9 2	—	—	10 7	9 7	10 10	—
Irish	9 4	8 10	9 4	8 8	9 4	7 10	9 3	8 8
Danish ...	—	—	9 10	9 4	9 8	8 6	—	—
POTATOES:—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Duke of York	—	—	86 6	80 0	106 6	86 6	—	—
Early Puritan	—	—	—	—	96 6	81 6	—	—
Other First Earlies	—	—	75 0	66 6	96 6	81 6	91 6	—
HAY:—								
Clover ...	90 0	75 0	97 0	73 6	93 6	79 0	80 0	75 0
Meadow ...	77 6	60 0	—	—	83 6	62 6	—	—

DISEASES OF ANIMALS ACTS, 1894 to 1910.

NUMBER OF OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(*From the Returns of the Board of Agriculture and Fisheries.*)

Disease.	July. 1911.	July. 1910.	Seven Months ended July. 1911.	Seven Months ended July. 1910.
Swine-Fever:—				
Outbreaks	236	153	1,568	884
Swine Slaughtered as diseased or exposed to infection ...	3,258	1,506	18,235	8,014
Anthrax:—				
Outbreaks*	37	79	512	889
Animals attacked	47	97	639	1,078
Foot-and-Mouth Disease:—				
Outbreaks	6	1	7	1
Animals attacked	402	14	420	14
Glanders (including Farcy):—				
Outbreaks	10	33	114	211
Animals attacked	19	148	291	649
Sheep-Scab:—				
Outbreaks	—	11	303	326

* For 1910 the figures show the outbreaks reported, but for 1911 the outbreaks confirmed.

IRELAND.

(*From the Returns of the Department of Agriculture and Technical Instruction for Ireland.*)

Disease.	July. 1911.	July. 1910.	Seven Months ended July. 1911.	Seven Months ended July. 1910.
Swine-Fever:—				
Outbreaks	13	8	76	65
Swine Slaughtered as diseased or exposed to infection ...	408	212	1,382	1,553
Anthrax:—				
Outbreaks	1	1	6	5
Animals attacked	1	1	7	8
Glanders (including Farcy):—				
Outbreaks	—	—	2	1

ADDITIONS TO THE LIBRARY.

[NOTE.—The receipt of *annual* publications of foreign agricultural and other departments, experiment stations and societies is not noted in the monthly list of additions to the Library. A list of these publications appeared in the *Journal* for October, November, and December, 1909.]

Agriculture, General and Miscellaneous—

Deutsche Landwirtschafts-Gesellschaft.—Arbeiten. Heft 187:—Betriebsverhältnisse der deutschen Landwirtschaft. Stück XII. (105 pp.) [A. 28.] Heft 188:—Betriebsverhältnisse der deutschen Landwirtschaft. Stück XIII. (80 pp.) [A. 28.] Berlin: Paul Parey, 1911.

Maeso, C. M.—El Uruguay a Través de un Siglo.* (533 pp.) Montevideo, 1910. [A. 84.]

Ontario Department of Agriculture, Ontario Agricultural College.—Bull. No. 188:—Weeds of Ontario. (144 pp.) Toronto, 1911. [B. 20–3.]

Illinois Agricultural Experiment Station.—Circ. No. 149:—Part I. Results of Scientific Soil Treatment. Part II. Methods and Results of Ten Years' Soil Investigations in Illinois. (32 pp.) Urbana, Illinois, 1911. [B. 40–7.]

Iowa Agricultural Experiment Station.—Bull. No. 124:—A Centrifugal Method for the Determination of Humus. (368–385 pp.) Ames, Iowa, 1911. [B. 40–5.]

Wisconsin Agricultural Experiment Station.—Research Bull. No. 14:—Sulphur Requirements of Farm Crops in Relation to the Soil and Air Supply. (21 pp.) Madison, Wisconsin, 1911. [B. 40–9.]

U.S. Dept. of Agriculture, Bureau of Soils.—Bull. No. 71:—Soil Erosion. (60 pp.+xxxiii plates.) Washington, 1911. [B. 40–1.]

Hawaii Agricultural Experiment Station.—Press Bull. No. 30:—Killing Weeds with Arsenite of Soda. (15 pp.) Honolulu, 1911. [B. 20–3.]

Memoirs of the Geological Survey.—Summary of Progress of the Geological Survey of Great Britain and the Museum of Practical Geology for 1910. (87 pp.) London: E. Stanford, 1911. 1*s.* [B. 36.]

Report of the Imperial Education Conference, 1911. [Cd. 5666.] (267 pp.) London: Wyman and Sons, 1911. 1*s.* [B. 44–3.]

Departmental Committee on Educational Endowments.—Vol. I.:—Report. [Cd. 5662.] (43 pp.) 5*d.* Vol. II.:—Minutes of Evidence, Appendices, and Index. [Cd. 5747.] (273 pp.) 2*s.* 3*d.* [B. 44–3.] London: Wyman and Sons, 1911.

Board of Trade, Exhibitions Branch.—Report on the Argentine Centennial Exhibitions, Buenos Aires, 1910. [Cd. 5677.] (69 pp.) London: Wyman and Sons, 1911. 7*d.* [A. 82.]

Rees, Bertha.—Longevity of Seeds and Structure and Nature of Seed Coat. (393–414 pp. and plates.) [Reprinted from Proc. Roy. Soc. Victoria, Vol. XXIII. (New Series), Part II.] Melbourne, 1911. [B. 18.]

Fry, Sir E., and *Fry, Agnes.*—The Liverworts, British and Foreign. (74 pp.) London: Witherby and Co., 1911. 2*s.* 6*d.* net. [B. 16–1.]

Fritsch, J.—The Manufacture of Chemical Manures. (339 pp.) London: Scott, Greenwood, 1911. 10*s.* 6*d.* net. [B. 26.]

Field Crops—

U.S. Dept. of Agriculture, Bureau of Plant Industry.—Bull. No. 209:—Grimm Alfalfa and its Utilisation in the North-west. (66 pp.) Washington, 1911. [C. 44–3.]

Deutsche Landwirtschafts-Gesellschaft.—Arbeiten. Heft 181:—Dreijährige Zuckerrüben-Anbauversuche 1907–1909. (192 pp.) Berlin: Paul Parey,

Wyoming Agricultural Experiment Station.—Bull. No. 86 :—Potatoes. (20 pp.) [C. 26–3.] Bull. No. 87 :—Wyoming Forage Plants and their Chemical Composition—Studies No. 4. (152 pp.) [C. 44.] Laramie, Wyoming, 1911.

Edinburgh and East of Scotland College of Agriculture.—Report XXIII. :—Experiments in the Improvement of Old Pasture, 1908–1910. (8 pp.) [C. 42–9.] Report XXIV. :—Experiments with Potatoes, 1910. (10 pp.) [C. 26–3.] Edinburgh, 1911.

Nebraska Agricultural Experiment Station.—Bull. No. 120 :—Alfalfa Management. (13 pp.) Lincoln, Nebraska, 1911. [C. 44–3.]

Horticulture—

Paddock, W., and *Whipple, O. B.*—Fruit Growing in Arid Regions, an Account of Approved Fruit-Growing Practices in the Inter-Mountain Country of the Western United States. (395 pp.) New York: The Macmillan Co., 1910. 6*s.* 6*d.* net. [D. 6; D. 28–1.]

Sanders, T. W.—Shady Gardens. ["One and All" Garden Books, No. 32.] (20 pp.) London: Agricultural and Horticultural Assn., Ltd., 1911. 1*d.* [D. 26–1.]

U.S. Dept. of Agriculture.—Farmers' Bull. No. 426 :—Canning Peaches on the Farm. (26 pp.) [D. 38–1.] No. 433 :—Cabbage. (23 pp.) [D. 20.] No. 434 :—The Home Production of Onion Seed and Sets. (24 pp.) [D. 20.] Washington, 1911.

U.S. Dept. of Agriculture, Bureau of Plant Industry.—Bull. No. 204 :—Agricultural Explorations in the Fruit and Nut Orchards of China. (62 pp.) [D. 14.] Washington, 1911.

Pennsylvania Agricultural Experiment Station.—Bull. No. 106 :—The Apple in Pennsylvania: Varieties, Planting, and General Care. (19 pp.) Centre County, Pennsylvania, 1910. [D. 30.]

Wisconsin Agricultural Experiment Station.—Bull. No. 201 :—Planting the Commercial Orchard. (34 pp.) Madison, Wisconsin, 1911. [D. 30.] [This bulletin deals with apple trees only.]

Storrs Agricultural Experiment Station.—Bull. No. 66 :—Apple Growing in New England, IV.—Orchard Management. (211–263 pp.) Storrs, Connecticut, 1911. [D. 30.]

U.S. Dept. of Agriculture, Bureau of Chemistry.—Bull. No. 140 :—Enological Studies.—The Occurrence of Sucrose in Grapes. The Sugar and Acid Content of Different Varieties of Grapes, Sampled at Frequent Intervals during Ripening and at Full Maturity. (24 pp.) Washington, 1911. [D. 48.]

Cornell Agricultural Experiment Station.—Bull. No. 292 :—Cauliflower and Brussels Sprouts on Long Island. (227–286 pp.) Ithaca, New York, 1911. [D. 20.]

Missouri Agricultural Experiment Station.—Bull. No. 97 :—Co-operation among Fruit Growers. (58 pp.) Columbia, Missouri, 1911. [D. 28–3; N. 4–3.]

Belletre, G.—Le Marché Anglais des Fruits et la Co-operation des Agriculteurs en Vue de l'Exportation. (231 pp.) Paris: C. Amat, n.d. [D. 4; N. 4–7.]

Speer, A. E.—Annual and Biennial Garden Plants. Their Value and Uses, with Full Instructions for their Cultivation. (256 pp.) London: John Murray, 1911. 7*s.* 6*d.* net. [D. 26–1.]

Plant Diseases—

Osborn, T. G. B.—*Spongospora subterranea* (Wallroth), Johnson. [Annals

Nebraska Agricultural Experiment Station.—Bull. No. 119:—Spraying as an Essential Part of Profitable Apple Orcharding. (26 pp.) Lincoln, Nebraska, 1911. [E. 20–5.]

U.S. Dept. of Agriculture, Bureau of Plant Industry.—Bull. No. 213:—Crown-Gall of Plants: Its Cause and Remedy. (215 pp.) [E. 60–23.] Washington, 1911

U.S. Dept. of Agriculture, Bureau of Entomology.—Technical Series, No. 16:—Papers on Coccidæ or Scale Insects. Part IV.—Catalogue of Recently Described Coccidæ, III. (59–74 pp.) Technical Series, No. 20:—Technical Papers on Miscellaneous Forest Insects. Part III.—A Revision of the Powder-Post Beetles of the Family Lyctidæ of the United States and Europe. (107–138 pp.) [E. 40–3.] Part IV.—Studies in the Sawfly Genus Hoplocampa. (139–148 pp.+plates.) [E. 40–51.] Washington, 1911.

Cornell Agricultural Experiment Station.—Bull. No. 283:—The Control of Insect Pests and Plant Diseases. (463–498 pp.) [E. 20–3.] Bull. No. 288:—Spray Injury Induced by Lime-Sulphur Preparations. (101–137 pp.) [E. 20–5.] Bull. No. 289: Lime-Sulphur as a Summer Spray. (139–162 pp.) [E. 20–5.] Bull. No. 290:—Studies of the Fungicidal Value of Lime-Sulphur Preparations. (163–207 pp.) [E. 20–5.] Bull. No. 291:—The Apple Red Bugs. (211–225 pp.) [E. 40–51.] Bull. No. 293:—The Black Rot Disease of Grapes. (287–364 pp.+plates.) [E. 60–13.] Ithaca, New York, 1911.

Pethybridge, G. H., and *Murphy, Paul A.*—A Bacterial Disease of the Potato Plant in Ireland. [Proc. Roy. Irish Acad., Vol. XXIX., Section B, No. 1, 1911.] (37 pp. and plates.) Dublin, 1911. [E. 60–37.]

French, C.—A Handbook of the Destructive Insects of Victoria, with Notes on the Methods of Prevention and Extirpation. Part V. (169 pp. and plates.) Melbourne, 1911. 2s. 6d. [E. 14.]

Indian Forest Memoirs, Forest Zoology Series.—Vol. II., Part I.:—On some important Insect Pests of the Coniferæ of the Himalaya, with Notes on some Insects Predaceous and Parasitic upon them. (69 pp. and plates.) Calcutta, 1911. 7*s.* [E. 40–13; E. 40–9.]

Janini, Rafael J.—Datos Reunidos para la Reconstitución de los Viñedos Valencianos Destruidos por la Filoxera.* (26 pp. and charts.) Valencia, 1911. [E. 6; E. 40–37.]

Sedgwick, S. N.—Butterflies and How to Identify Them. (63 pp.) London: C. H. Kelly, 1911. 1*s.* net. [E. 40–3.]

Live Stock—

Wisconsin Agricultural Experiment Station.—Circ. of Information No. 21:—Distribution of Licensed Stallions in Counties of Wisconsin. (106 pp.) Madison, Wisconsin, 1911. [F. 46.]

Nebraska Agricultural Experiment Station.—Bull. No. 117:—Growing Feeder Steers in Western Nebraska. (54 pp.) Lincoln, Nebraska, 1911. [F. 68–1.]

Gossett, Adelaide L. J.—Shepherds of Britain. Scenes from Shepherd Life Past and Present. (331 pp.) London: Constable and Co., 1911. 7*s.* 6*d.* net. [F. 76.]

U.S. Dept. of Agriculture, Bureau of Animal Industry.—Circ. No. 178:—Breeding Horses for the United States Army. (13 pp.) Washington, 1911. [F. 64–9.]

Dairying and Food, General—

Canada, Dept. of Agriculture, Dairy and Cold Storage Branch.—Bull. N 26:—Dairy Legislation. (16 pp.) Ottawa, 1910. [G. 20.]

Vincent, R.—On the Production of Pure Milk: An Account of the Metho Employed at the Infants' Hospital Farm. (22 pp.) London: P. S. Ki

Koning, C. J.—Biologische und Biochemische Studien über Milch, Drittes (Schluss) Heft. (144 pp.) Leipzig: M. Heinsius Nachfolger, 1911. [G. 56–1.]

Wisconsin Agricultural Experiment Station.—Bull. No. 200:—The Selection of Feeds for Dairy Cattle. (17 pp.) [G. 50–7.] Circ. of Information No. 20:—The Control of Moisture in Cheese. (14 pp.) [G. 66–1.] Madison, Wisconsin, 1911.

Ayrshire Cattle Milk Records Committee.—Report on Milk Records for Season 1909. Record of 9,202 Cows. (313 pp.) Kilmarnock, 1910. [G. 56–7.]

Storrs Agricultural Experiment Station.—Bull. No. 65:—Butter Making on the Farm. (191–210 pp.) Storrs, Connecticut, 1911. [G. 60–1.]

Colorado Agricultural Experiment Station.—Bull. No. 163:—Farm Butter Making. (16 pp.) Fort Collins, Colorado, 1910. [G. 60–1.]

U.S. Dept. of Agriculture, Bureau of Animal Industry.—Circ. No. 171:—Fermented Milks. (131–161 pp.) [G. 56–1.] Circ. No. 179:—Cow-Testing Associations. (24 pp.) [G. 56–7.] Bull. No. 134:—The Estimation of Total Solids in Milk by the Use of Formulas. (31 pp.) [G. 56–3.] Washington, 1911.

Canada, Dept. of Agriculture, Branch of Dairy and Cold Storage Commissioner.—Bull. No. 29:—Notes for Factory Cheesemakers. (7 pp.) Ottawa, 1911. [G. 66–1.]

Wisconsin Agricultural Experiment Station.—Research Bull. No. 13:—Studies of the Protein Requirements of Dairy Cows. (175–216 pp.) Madison, Wisconsin, 1911. [G. 50–7.]

Veterinary Science—

Wisconsin Agricultural Experiment Station.—Circ. of Information No. 23:—A Catechism on Bovine Tuberculosis. (24 pp.) Madison, Wisconsin, 1911. [H. 54–7.]

Local Government Board.—Reports on Public Health and Medical Subjects, New Series, No. 53:—Further Reports (No. 4) on Flies as Carriers of Infection. (48 pp.) London: Wyman and Sons, 1911. 4*d.* [H. 50–1.]

Cornell Agricultural Experiment Station.—Bull. No. 285:—The Cause of "Apoplexy" in Winter-Fed Lambs. (37–46 pp.) Ithaca, New York, 1910. [H. 42–1; F. 76–1.]

Colorado Agricultural Experiment Station.—Bull. No. 162:—Rabies. (8 pp.) Fort Collins, Colorado, 1910. [H. 44.]

U.S. Dept. of Agriculture, Bureau of Animal Industry.—Circ. No. 169:—A Study of Surra found in an Importation of Cattle, Followed by a Prompt Eradication. (77–97 pp.) [H. 50–3.] Bull. No. 133:—The Determination of Nicotin in Nicotin Solutions and Tobacco Extracts. (22 pp.) [H. 28–7; C. 54.] Bull. No. 136:—The Diagnosis of Glanders by Complement Fixation. (31 pp.) [H. 34–3.] Washington, 1911.

Departmental Committee on Swine Fever.—Interim Report. Part II.:—Minutes of Evidence, Index and Appendix. [Cd. 5680.] (398 pp.) *London: Wyman and Sons, 1911. 3s. 5d.* [H. 40–3.]

Deutsche Landwirtschafts-Gesellschaft.—Arbeiten. Heft 189:—Studien über funktionelle Anpassung und über anatomische und physiologische Unterschiede zwischen warm- und kaltblütigen Pferden. (116 pp.) Berlin: Paul Parey, 1911. [H. 34–1; F. 64–1.]

Illinois Agricultural Experiment Station.—Bull No. 149:—Tuberculosis of Farm Animals. (313–431 pp.) Urbana, Illinois, 1911. [H. 54–3.]

[Books may be borrowed from the Board's Library on certain conditions, which may be ascertained on application. The volumes marked * are not available for lending.]

THE JOURNAL

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SEPTEMBER, 1911.

GRANTS FROM THE DEVELOPMENT FUND FOR THE PROMOTION OF AGRICULTURAL RESEARCH AND LOCAL INVESTIGATIONS.

THE Board of Agriculture and Fisheries have been in communication with the Development Commissioners with a view to the formulation of a scheme for the promotion of agricultural research and local investigations in England and Wales, and the Treasury, on the recommendation of the Commissioners, have now sanctioned the allocation of funds to be distributed by the Board in accordance with the general principles set out below. The total maximum sum which will be expended when the scheme is in full operation will be about £50,000 per annum.

The scheme provides for—

(1) A system of agricultural research which will secure for each group of the problems affecting rural industry a share of attention roughly proportional to its economic importance;

(2) The concentration of the scientific work on each group at one institution or at institutions working in combination;

(3) Grants for special investigations for which provision may not otherwise be made;

(4) The grant of scholarships with a view to the increase of the number of men fully qualified to undertake agricultural research;

(5) The carrying out of investigations into problems of local importance, especially those involving the application of modern research to local practice, and the provision of scientific advice for farmers on important technical questions.

SUBJECTS OF RESEARCH.

In making arrangements for the separate investigation, as far as possible, of each group of allied subjects, the Commissioners and the Board have been impressed with the importance of securing continuity in work which is necessarily of considerable duration, and at the same time of providing staffs of specialists and experts, who will be permanently engaged on work arising from the investigation of the same group of problems. By this means, concentration and economy of effort will be better secured than it would be if a number of institutions were dealing at the same time with the same group of problems.

It is neither desirable nor possible to prevent all overlapping or duplication of work, but it is obviously necessary to proceed on a plan by which research work subsidised from public funds will not be unnecessarily duplicated. It is also desirable to arrange that each problem shall be undertaken by the institution best fitted to deal with it, and usually by the institution which has specially devoted its attention to problems of an allied nature.

It is also important to avoid the giving of undue attention to one part of the field of agricultural research, to the exclusion of other parts which are of equal scientific and economic importance.

With these considerations in view, it has been arranged that grants should be made for research in the following groups of subjects:—

(1) Plant Physiology.

(2) Plant Pathology and Mycology.

(3) Plant Breeding.

(4) Fruit Growing, including the practical treatment of plant diseases.

(5) Plant Nutrition and Soil Problems.

(6) Animal Nutrition.

(7) Animal Breeding.

(8) Animal Pathology.

(9) Dairying.

(10) Agricultural Zoology.

(11) Economics of Agriculture.

SPECIAL GRANTS FOR RESEARCH.

A sum not exceeding £3,000 per annum will be available for assistance in respect of special investigations for which provision is not otherwise made.

Grants from this fund will be made on the recommendation of the Board's Advisory Committee on Agricultural Science, who will consider, not only whether the proposed investigation is desirable in itself, but whether it could not be better carried out at one of the special Research Institutions referred to above. The grants will be made from year to year, and will be for one year only in each case.

SCHOLARSHIPS.*

In order to secure the services of a number of carefully trained men for work in connection with the scheme, the Board propose in each of the years 1911, 1912, and 1913, to offer twelve scholarships of the value of £150 per annum, tenable for three years.

It is proposed that candidates for scholarships should be selected by a special committee, representing the Institutions under whom the selected candidates will subsequently work. The award of twelve scholarships will be conditional on a sufficient number of thoroughly suitable candidates presenting themselves.

LOCAL ADVICE AND INVESTIGATIONS.

Grants will also be made to certain Universities, University Colleges, and Agricultural Colleges in England and Wales, for the purpose of enabling them to supply scientific advice to farmers on important technical questions, and to carry out investigations into problems of local interest, which can be more conveniently studied on the spot than at one of the Research Institutions.

By means of these grants it is hoped to provide an expert staff possessing both scientific and practical qualifications, who will devote themselves to solving difficult local problems, and in other ways endeavour to secure the application of science to practice.

THE IDENTIFICATION AND ERADICATION OF SOME COMMON WEEDS.

II.*

HAROLD C. LONG, B.SC. (Edin.).

With Drawings from Nature by Bertha Reid.

IN the present article three weeds of the order *Cruciferae* will be dealt with; all of them are annuals, and two of them (Charlock and Runch) are among the worst weed pests of the farm.

CHARLOCK.

Charlock (*Sinapis arvensis*, L., or *Brassica Sinapis*, Visiani, or *Brassica Sinapistrum*, Boiss.) is commonly known to farmers under such names as Kedlock, Skallock, Karlock, Yellows, Yellow Weed, or Wild Mustard. Taking Great Britain as a whole, it is probably the most troublesome of all annual weeds of arable land, and in twenty-nine returns from practical agriculturists throughout England, Scotland, and Wales, as to the six worst weeds of arable land, Charlock and Runch, taken together, occupied a position which was second only to various species of couch or twitch. So serious is the damage that this weed may cause that, in 1900, the Board of Agriculture issued a leaflet dealing with its destruction.† From this leaflet the following quotation may be given:—

"In corn crops its growth is often so rank as seriously to reduce the yield of grain. In root and bean crops the weed can be more easily dealt with; but here also it often proves very injurious, and especially so when the conditions of the weather, or scarcity of labour, prevent its timely eradication. As a rule, it is not conspicuous amongst rotation grasses or clover, and it is practically absent from permanent grass land.

"The injury induced by charlock is partly direct and partly indirect. It competes with crops for light and air; that is to say, it overgrows more or less completely, and smothers, other plants with which it is associated. It also robs crops of a part of their nutriment, and prevents their deriving full benefit from the moisture of the soil. But in other ways—though more indirectly—this weed may be the cause of much loss. The turnip "fly," for instance, would be unable to exist in

* The first article appeared in the *Journal* for July, 1911, p. 288, and dealt with [Bu]ttercup, Common Fumitory and Spurrey.

† No. 63 (*Destruction of Charlock*).

early summer, when the cultivated crops on which it preys are, for the most part, absent from our fields, did it not find weeds like charlock to supply it with food; and similarly the turnip-gall weevil is often found in the roots of charlock. Then, again, the microscopic fungus that causes finger-and-toe finds a congenial habitat in the roots of this plant, which may thus do much to carry the disease over the years that separate two turnip crops."

In two cases quoted by Schultz* the presence of charlock in cereal crops caused the loss of one-third to two-thirds of the crop, the yields on charlock-infested plots and on plots from which the weed had been eradicated being as follows:—

	With Charlock.	Without Charlock.	Approximate Loss due to Charlock.
	Bushels per Acre.	Bushels per Acre.	Per Cent.
1. Oats	45	67	33
2. Oats	24·8	76·5	67·5

Charlock occurs on almost all soils, particularly, perhaps, on light calcareous loams.* Brenchley found,† that between Harpenden and Bedford it was characteristic of clay soils, being "frequent" on clay and heavy soil, and also on chalk, but "occasional" on sand and light loam.

Not only is charlock a strong and rapid grower, but it produces a large quantity of seed (according to Nobbe,‡ up to 4,000 seeds on a single plant), the seeds ripening quickly, and being easily shed from the pods.

Seeds.—The seeds of charlock (Fig. 1, *a*) are spherical, or slightly compressed, almost smooth and finely pitted or dimpled, and $\frac{1}{25}$ to $\frac{1}{18}$ in. (1 to 1·5 mm.) in diameter. When ripe they are dark brown or black-brown to nearly black or blue-black, but when not quite ripe they are reddish to brown. When chewed, the seeds have a sharp biting taste, like mustard. Harz says that 1,000 large seeds weigh 1·478 grams. They ripen quickly, are rich in oil, and possess considerable vitality, lying dormant in the soil for many years, especially when they lie at considerable depths in the soil.

* *Arb. der Deut. Landw. Gesell.*: Ackersenf und Hederich, Gustav Schultz, 1909.
† *Jour. Bd. Agric.*, April, 1911, p. 18.
‡ Dr. Fr. Nobbe. *Handbuch der Samenkunde*, 1876.

Peter has shown * that they may thus retain their germinative capacity for forty years. On the other hand, we find it stated † that "The seeds are longer-lived than most others of the Mustard family. Recent research work showed that they do not retain their vitality beyond fifteen years." It is probable that the vitality is chiefly dependent on the natural conditions to which the seeds are subjected, the period being much longer in some instances than in others. In dealing with charlock and wild radish, Pitt wrote, over 100 years ago, that "as they are very quick of growth, and perfect their seeds expeditiously, it is not uncommon for these plants to shed their seeds at the rate of several bushels per acre, and, as it is well known that the seeds will vegetate after laying many years in the ground, it is no wonder they should produce a plentiful crop." ‡ The seeds are frequently brought to the surface by an extra deep ploughing, and while charlock disappears when land is laid down to grass, it is almost certain to spring up when old grass land is ploughed. Owing to this inherent vitality of the seed, the weed is the more difficult to deal with.

The charlock pod is 1–2 ins. long, with a straight deciduous beak; it is on a slender pedicel, is two-valved, and, when ripe, opens longitudinally, to permit the seeds to fall out [cf. *Raphanus Raphanistrum*, p. 465, in which the pod breaks into jointed pieces]. The seeds of charlock cannot, unfortunately, be easily distinguished from those of the turnip, which are of about the same size, but not quite so dark in colour, while their surface is rather rougher in texture, and they have not the same pungent taste: adulteration with dead charlock seeds was formerly common.

Seedlings.—An examination of the first seedling stage (Fig. 1, *b*) shows that the root is fibrous and slender, and the hypocotyl stout, white, smooth, and shiny. As in most other *Brassicas*, the cotyledons are heart-shaped; one is larger than the other, and the notch or sinus at the top is rather deep and broadly V-shaped. The cotyledons are dark green above, sometimes with a rather reddish tinge beneath, especially in more

* Deut. *Landw. Presse*, July 24th, 1909, p. 636.

† *Weeds of Canada*, Canad. Dep. Agric., 2nd ed., 1909, p. 93.

‡ Pitt: "On the Subject of Weeding; or The Improvements to be ... griculture by the Extirpation of Weeds."—*Communications to the* ... *ture*, Vol. v, 1806, p. 248.

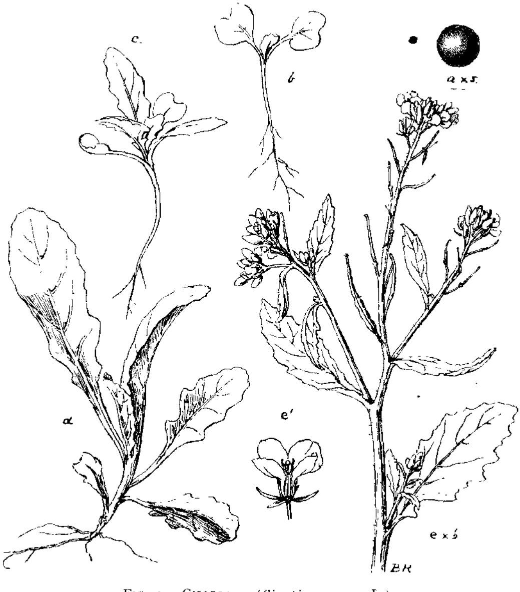

FIG. 1. -CHARLOCK (*Sinapis arvensis*, L.).

a, Seed, nat. size and × 5; *b*. cotyledon stage of seedling × 1; *c*, second stage of seedling × 1: *d*, third stage of seedling × 1; *e*, flowering and fruiting portion × ½; *e'*, flower × 1.

the early stages, while they are smooth and have long stalks which are broad, channelled above, and unequal in length.

Before the first "rough leaf" appears, the cotyledons are respectively about ⅙ in. long by ¼ in. broad (4 mm. by 6 mm.), and ⅕ in. long by ⅓ in. broad (5 mm. by 8 mm.). With the appearance of the "rough leaf" the cotyledons enlarge considerably, attaining ⅖ in. (1 cm.) in diameter, while the stalks lengthen until about ⅘ in. (2 cm.) in length. The first leaves (Fig. 1, *c*) are dark green in colour, hairy and harsh to the touch, and somewhat spatulate or elongate-oval. [At this point it is important to distinguish the charlock seedling from that of the turnip, in which the first leaves are lighter green, nearly smooth, and about equal in length and breadth.]

The progress of the seedling is now rapid (Fig. 1, *d*), the cotyledons attaining ½ in. long by ⅔ in. broad (1·2 cm. by 1·6 cm.). The leaves are irregular, elongate-oval to oval or ovate, toothed, light-green, alternate, and hairy, while the stem is also hairy.

Charlock appears to vary considerably, according to its environment, and while some seedlings may be almost or quite smooth until the third stage is reached, or even until they approach flowering, they are, in general, harsh to the touch when the second stage is passed.

Mature Plant.—It may be said that in general appearance charlock (Fig. 1, *e*) resembles the closely related turnip. The root is stout and fibrous, the stem is branched, 1 to 3 ft. high, and rough with hairs; the leaves are rough and variable in shape, being ovate, oblong to lanceolate, or sometimes lyrate, and the lower ones are frequently segmented or lobed at the lower and broader end—the upper leaves are sessile, the lower ones stalked; the yellow cruciform flowers (Fig. 1, *e′*) are large—½ in. or over in diameter—and occur in loose terminal racemes; the pods are smooth or rather rough, angular, and spreading, and 1 to 2 ins. in length, the terminal third being a stout beak, which often contains one seed. Flowering continues throughout the summer months.

Prevention and Remedy.—For the most part preventive and remedial measures in the case of charlock are intimately connected, but it may be said that there are three chief means of

(2) the prevention of seeding and the concurrent destruction of both seedlings and old plants by mechanical means; and (3) the destruction of the weed by spraying.

(1) The first suggestion is obvious, and need not be enlarged on here.

(2) The second plan may often prove very successful, and in root and pulse crops the weed may generally be kept in check by regular hand and horse hoeing, while a crop of early potatoes, with the constant tillage it receives, is particularly useful in reducing charlock. Corn crops may also be hand hoed, and if the weed is allowed to grow tall, hand pulling will be necessary. When the plants are in flower, seeding may to some extent be prevented by chopping off the flowering heads by means of specially constructed machines, by scythes, reaping hooks, or hooks with jagged teeth; by this time, however, the damage for the current year will have been accomplished.

An excellent plan is to resort to surface cultivation in spring, by harrowing the soil to a fine tilth in order to encourage the seeds to germinate, then destroying the seedlings by harrowing or the use of the American weeder. In bad cases the process may be repeated, while the practice is often useful in a mild autumn, the young plants being killed by the first frost.

Finally, where the reaper is used, a good practice is to employ a trough attachment to the pan of the reaper, in which seeds shaken or beaten out may be caught, and subsequently destroyed. The trough should be covered with a perforated lid, through which the seeds may fall. According to Maier-Bode,* in a trial conducted at Leipzig in connection with wheat and oats, no less than 30·4 lb. of pure weed seeds were collected per acre in the case of wheat, and 35·6 lb. per acre in the case of oats, while many seeds in seed vessels were trapped in addition. Of the seeds caught in harvesting the wheat and oats, 22·15 per cent. and 21·12 per cent. respectively were charlock.

(3) As regards spraying, the principle is based upon the fact that a weak solution of copper sulphate or iron sulphate sprayed on a cereal crop has little effect on the cereal, while it quickly destroys the seedlings of charlock. This is doubtless because the leaves of cereals are narrow, smooth, and more or less erect, hence not retaining much of the solution used, and

so escaping permanent injury; the young leaves of charlock, on the other hand, are broad, rough, and more or less horizontal, and retain the spray fluid, to their destruction. The solution used should be a 2, 3, or 4 per cent. solution of copper sulphate* (8, 12, or 16 lb. in 40 gallons of water), or a 15 per cent. solution of iron sulphate* (60 lb. in 40 gallons of water), 40 gallons in either case being sufficient for an acre. Where a 2 per cent. solution of copper sulphate is used, it may be useful to spray a second time, after an interval of ten days or a fortnight. In wet climates the stronger solution should be employed. Soft water should be used when possible, and the spraying machine should generate a fine spray under air pressure. Spraying should take place during calm, settled weather, about the time the charlock enters the "rough leaf" stage, about May or June, when it is not more than 3in. high, and the corn crop is still rather short.† Wooden buckets and tubs must be used to prepare the solution.

Experimental results show that spraying as recommended above does no permanent injury to the corn crop, nor to "seeds" sown in such a crop, while, in some cases at least, mangolds, beans, peas, tares, and sainfoin have been sprayed for the purpose of destroying charlock without injury to the crops concerned.

Poisonous Properties.—The whole charlock plant is irritant in character when in bloom, but the seeds are considered dangerous if eaten. It is stated by Cornevin ‡ that when used in admixture in the manufacture of a poor quality oil-cake, and fed to cattle, the cake caused intestinal inflammation, severe diarrhœa, and great thirst, probably due to oil of mustard. Percival says that the seeds "are sold by many farmers to oil-cake manufacturers, finally appearing as impurities in rape and other 'cakes.'" §

WILD RADISH.

The Wild Radish (*Raphanus Raphanistrum*, L.), known also as Runch, Jointed Charlock, or White Charlock, is a weed closely allied to *Sinapis arvensis*, which it resembles in habit,

* Ninety-eight per cent. pure.

† Charlock may also be sprayed when in flower; though spraying at this time is to be avoided when it is possible to spray the seedlings, yet it results in the destruction of many of the flowers and so largely prevents the formation of seed.

‡ Ch. Cornevin, *Des Plantes Vénéneuses.*

§ John Percival, *Agricultural Botany*, 4th ed., 1910, p. 385.

and is, perhaps, in some districts, the more common weed. When present in quantity, as is often the case, Runch is quite as harmful as common charlock, and it occurs on soils similar to those specified for that weed.

Seeds.—The seeds of wild radish are often enclosed in an egg-shaped or cylindrical portion of the pod. They are variable in size and shape, but may be described as oval or egg-shaped, somewhat compressed, reddish-brown to dark-brown, apparently smooth, but seen under a lens to be covered with a fine whitish network due to shallow depressions, and ⅛ in. (3 mm.) in length (Fig. 2, *a*). Schultz says they contain 30 to 35 per cent. of oil.

Seedlings.—In the early stage seedling (Fig. 2, *b*) the root is short and fibrous, and the hypocotyl thick and fleshy, whitish, and smooth. The cotyledons are broadly heart-shaped, about equal, with equal lobes, smooth, light green above to yellowish-green or nearly yellow beneath, with alternately branched midrib, and long, rather broad petiole, which is channelled above and convex below. They are about ⅓ in. long by ½ in. broad (8 mm. by 12 mm.). The petioles are unequal in length.

In the second stage (Fig. 2, *c*) the cotyledons are larger, more clearly heart-shaped, and the alternate branches of the midrib more clearly defined. They are now about ⅜ in. long by ⅝ in. broad (1 cm. by 1·5 cm.). The first leaves are irregular or nearly spatulate, lobed and toothed, pointed at the apex, dark green and very hairy, with many veins which give a wrinkled appearance to the surface, and are borne on stalks about half the length of the blade.

The third stage is practically an enlarged form of the second, but the cotyledons have grown considerably, to ⅝ in. long by 1 in. broad (2 cm. by 2·5 cm.), and with petioles ⅝ in. and 1 in. long respectively (2 cm. and 2·5 cm.). The now elongate-oval leaves are deeply lobed towards the base, the lobes, however, being small. The whole plant is dark green and very rough with hairs, and before the flowering stem is sent up (*e.g.*, if the plant is a biennial) the leaves lie close to the ground, and are in rosette form (Fig. 2, *d*).

Mature Plant.—Runch is a stout, erect, spreading, and branched annual (or biennial), attaining 1–3 ft. in height. It is covered with rough hairs; the lower leaves are divided or

FIG. 2.—WILD RADISH (*Raphanus Raphanistrum*, L.).

Fruit × 1, 2, seed nat. size, and 3, seed × 4; *b*, cotyledon stage of eedling × 1; *c*, second stage of seedling × 1; *d*, third stage of seedling × 1; , flowering portion × 1.

lobed (sometimes lyrate), with a large terminal obovate segment, while the upper leaves may be entire and narrow; the flowers resemble those of charlock in size and form, but the petals vary in colour from white to pale straw yellow or pale lilac, with purplish veins; the seed-pods are 1–3 ins. long, terminate in a long pointed beak, are cylindrical to flattish or compressed, and are four- to eight- or even twelve-jointed, each joint containing a seed, and commonly breaking off when the pod is ripe (Fig. 2, *e*).

Prevention and Remedy.—This weed may be dealt with in identically the same manner as charlock, but it does not yield so readily to spraying in the older stages, and it is essential to spray when the seedlings are in the first rough-leaf stage.

NOTE.—In September, 1907, the Board received from Wolverhampton specimens of two cruciferous weeds allied to and resembling white charlock. These were *Raphanus microcarpus*, Willk., and *R. sativus*, L., var. *oleifer*, DC. The former is not very common in this country, while the latter is a rare casual. Some of the plants are very bulky, consisting of as many as twenty stems, while they are from 2 to 3 ft. high. As they were growing freely amongst corn, they were sprayed early with strong, pure, copper sulphate solution, which, however, was stated to have no effect on them whatever.* They should be combated by the mechanical means recommended in the case of charlock, as also should all species of wild Brassicas allied to the turnip.

SHEPHERD'S PURSE.

Shepherd's Purse (*Capsella Bursa-Pastoris*, DC.) is a well-known and widely distributed annual weed of arable land, and occurs in almost all situations and flowers at almost any season of the year from March to December. It grows well on most soils, but Brenchley found it "frequent" on chalk, clay, and heavy soils, and "occasional" on sand and light loams. Occasionally it occurs in great quantity, and as it grows rapidly and produces seeds and fresh generations throughout the summer months, it may cause much trouble, the seedlings following after one another in rapid succession as they are hoed out. A further objection to the presence of

Shepherd's Purse are repeated surface cultivation, and the free and continued use of the hoe among root-crops. An endeavour must be made to prevent seeding of many plants, which may often be overlooked owing to their being hidden by larger crop plants. The seeds occur in samples of clover and grass seeds, and care should be taken that only pure "seeds" be sown.

THE GROWTH OF THE CO-OPERATIVE MOVEMENT IN DENMARK.

The Board have received through the Foreign Office the following report, which has been drawn up by Mr. R. Turner, late Vice-Consul and Archivist at H.M. Legation at Copenhagen, on the growth and progress of the co-operative movement in Denmark.

Growth of the Co-operative Movement.—Until the latter half of the last century Denmark was a corn-producing country, but from thirty to forty years ago various causes combined to ruin this branch of agriculture in the country, and it was then that Danish farmers began to take up dairy farming. Such success attended this departure that Denmark is now cited as being second in the list of European countries ranked according to wealth per head of the population. The new departure was from the beginning encouraged by the Government, and the judiciously applied State aid is in no small measure responsible for its success.

Apart from the geographical and other natural advantages which Denmark enjoys as regards this special branch of the agricultural industry, its success is to be very largely ascribed to the perfection to which the system of co-operation has been brought in the country. In 1890, when the co-operative movement was as yet in its infancy, the butter exported from the country (to take one instance) was calculated at 97,480,000 lb., while in 1905 Denmark exported 186,360,000 lb. of butter. At the same time the number of co-operative dairies had increased from 781 to 1,068 (exclusive of some 200 communal dairies).

Danish Co-operative System.—The system of co-operation

the English Rochdale system. The first step was the foundation of a co-operative supply stores about the middle of last century, and this was followed in 1882 by the first co-operative dairy, which was started in that year by Herr Stilling Andersen at Hjedding. The movement has now developed so far that there is not a single matter of interest to the farmer that has not become the object of co-operation. The motto of co-operation in Denmark may be said to be "Each for all and all for each." This applies both to the liability incurred in raising the loan necessary to commence the undertaking, whatever it may be, and to the division of the profits of that undertaking.

Co-operation and Small Holdings.—Before dealing with the individual branches of agricultural co-operation in Denmark, it is necessary to give a brief glance at the conditions under which they have come into existence and flourished. A very well-informed Dane, in discussing the subject, stated that, in his opinion, the success of the co-operative movement in Denmark was dependent on the small holdings system, and, conversely, that without co-operation the system of small holdings would be impossible.

Land Legislation in Denmark.—The tenure of land in Denmark is, as regards the larger estates, very similar to that in England, and no special notice need be paid to it as concerning the object of this report. As regards small holdings and peasant farms, however, the position is different. All land legislation in Denmark for the past hundred years has tended to the formation of a peasant class *owning small farms,* as against the formation of large estates. Thus, an estate owner is encouraged to sell small holdings or farms to the peasants. Once a farm is in existence it must either be kept intact with all its buildings upon it, or it may be divided into two or more farms each to be worked separately, ***but it may not be incorporated into another to form one large farm.*** Then, too, the State has established a fund to advance money under very easy terms to suitable peasants to enable them purchase holdings for themselves. The peasant must ha saved a certain sum of money (in some cases about 10 p cent. of the purchase money of the holding—which vari between [illegible] and [illegible] including stock is consider

sufficient), and the State advances the rest at 3 per cent. interest, and with great facilities in the matter of repayment, retaining a mortgage on the land. Thanks to beneficial legislation, a great portion of the agricultural population in Denmark own the land they work. There are about 2,117 large estates, 75,320 peasant farms of from 20 to 150 acres, and 68,000 small holdings varying from 3 to 7 acres.

Prosperity of Peasant Farmers and Small Holders.—The peasant farmers and small holders are very prosperous; the latter are paying off the mortgages on their holdings, and it is found that the previous movement of the rural population to the towns has been in a large measure arrested. In this connection it may, too, be mentioned that since the State has offered pecuniary assistance to agricultural labourers to acquire their holdings, there has been a falling off in the number of emigrants.

Advantages of Co-operation to Small Agriculturists.—The peasant farmers and small holders, being naturally men of small means, would in many instances have found it very difficult to bring their produce to an advantageous market. By means of co-operation the small man is able to reach the best market possible. The co-operative dairy of which he is a member buys his milk of him at the market rate, and sells him back at a low price the separated milk on which he feeds his pig. The pig he sells to the co-operative bacon factory at a price determined by the demand of the British market, while his eggs are disposed of to the co-operative egg export association. In this manner he receives as good a price as if he were able to bring his produce himself to Copenhagen, nor do his benefits from co-operation cease there. He obtains all he wants for himself, his family, or his farm from a co-operative supply association, while a similar association insures him.

Character of the Danish Peasant.—It must not be forgotten that the Danish peasant is a very hard-working man. His hours are generally longer than in England, and his way of life cheaper. He is also very honest. This honesty, and the mutual trust which results from it, may be taken to be the moral foundation of the co-operative movement in

strengthened very greatly by the fact that, distances being small, most members of a co-operative undertaking are personally known to each other, it is difficult to imagine how the co-operative movement could have grown so rapidly.

Education.—To this innate honesty one must add an excellent education, received in the first instance at the State school, and later at one of the high schools, agricultural colleges, or cottars' schools. These schools, by bringing young men and women of the agricultural classes together, are undoubtedly not without their value in preparing them for working along co-operative lines.

These observations may, perhaps, be considered beside the mark, but the extraordinary success which has attended the introduction of co-operation into Danish agricultural life, cannot be ascribed solely to geographical formation and favourable legislation.

Co-operative Dairies.—The first co-operative dairy in Denmark was founded in 1882 in Jutland, and the movement almost immediately became general. So quickly, indeed, did co-operative dairies spring up over the whole country that in 1903, which, unless otherwise stated, will be the year of all figures given in this report, there were some eleven hundred such dairies.

Extent of the Movement.—A better idea of the extent of the movement will be gathered from the fact that there are 174,742 farms with cows in Denmark; of these 143,863, or 82·3 per cent., are in the hands of men who are members of a co-operative dairy. (N.B.—As these figures date from 1903, it may safely be taken that there has been some increase since that year, and it may be added that when the statistics were taken, some 4,800 of the circulars sent out were returned either not filled up, or unsatisfactorily filled up, so that these figures represent a minimum, not a maximum.) Again, of the 1,066,698 cows in Denmark, 862,986, or 80·9 per cent., are owned by farmers who are members of co-operative dairies, while of the remainder about 10 per cent. deliver their milk to joint dairies, so that about nine-tenths of the milk produced in the country is dealt with in dairies work

his point it is of interest to note the manner in which the lifferent classes of farms participate in this movement. Of the very small farms only 3·1 per cent. are members of a co-operative dairy, but at the same time the milk of 58 per cent. of all the cows owned by this class of peasant farmer is lelivered to some such dairy. In other words, most of these farmers are too small to possess a cow, while more than half of those that do are members of a co-operative dairy.

The next class most weakly interested in the co-operative dairy movement is that of the large farmers—in many cases the great land-owners—of whom only 43·5 per cent. are members of a co-operative dairy. In this case the reason is to be found in the fact that they are very often owners of dairies in which they deal with their own milk—in some few cases even adding to it by buying milk from their smaller neighbours.

Between these two extremes about 85 per cent. of all the farmers are members of a co-operative dairy, *i.e.*, about 85 per cent. of the milk produced in the country is sold to a co-operative institution.

Benefit of Co-operative Dairies to Smaller Farmers.—The immense benefit of this movement to the smaller farmers can hardly be over-estimated. It was formerly practically impossible for the smaller man to deal with the milk produced on his farm in such a manner as to secure a high and uniform standard of butter and cheese. He had to rely on the local market for the sale of his produce, and there was besides a considerable wastage of by-products. Under the co-operative system—which owes its success largely to the introduction of the centrifugal separators, which render it possible to deal with large quantities of milk expeditiously—the small farmer is assured of the best market obtainable, has more time for properly attending to his farm and stock, is able to buy back at a very low figure by-products such as separated milk, which he may need for his own purposes, and, most important of all, he has won the reliance of the market on the high and uniform standard of his produce.

Management of a Co-operative Creamery.—The society

The elections hold for a year. The committee appoints a manager, who is generally paid a lump sum yearly, out of which he has to pay the employees and himself. This system has many obvious disadvantages, and it is not unlikely that it will in time be changed. The manager, besides engaging the employees and supervising the working of the dairy, has to keep the books and generally control the whole business of the undertaking.

Fittings of the Creamery.—The creamery is almost invariably supplied with steam-driven centrifugal machines, and has one or more separators and pasteurisers, according to the amount of milk dealt with. The machines generally drive an electric plant and a cooling apparatus. All utensils are very carefully cleaned, as are the milk cans before their return to the farmer. Most of the machines and utensils appear to be of Danish manufacture, but English and German marks are sometimes seen. Great attention is paid to cleanliness in every department, and the farmers also are required to observe a very high standard in this respect.

Cartage of Milk.—The cartage of milk is generally done by the dairy society, who, in most cases, let it out to a contractor. The dairy charges the farmer so much per hundred pounds of milk. These charges vary from three to ten öre (rather less than ½*d.* to about 1½*d.*). The farmers are bound to deliver the milk on the main road, where it is collected by the carrier. It is a common sight in Denmark to see two or three milk cans standing by the side of the road for the carrier to pick up. These cans hold a hundred pounds of milk, and are supplied by the dairy.

Treatment of the Milk.—The milk is weighed on receipt at the creamery and entered to the subscriber's account. Payment is made according to the amount of butter-fat contained in the milk. Every dairy makes regular tests of the milk supplied by its subscribers, and any falling below a certain standard is immediately notified to him, and if the fault is not remedied his milk is refused. Great care is also exercised to prevent milk from any diseased animals being sent to the creamery. Some co-operative societies even go the length

pects one or more of his cows of being tuberculous, and, in consequence, does not send his milk to the creamery.

Formation of a Co-operative Dairy.—The capital required to start an average Danish creamery varies from £1,200 to £1,500. This sum, which would cover everything, is advanced to the co-operative society by a bank or other institution having money to invest. The farmers forming the society pledge themselves, each according to the number of cows on his farm, to be liable for this loan. The bank holds a mortgage on the factory or creamery, and has further right of recovery against each farmer in proportion to the extent of his guarantee. The farmer undertakes to sell *all* the milk produced on his farm for a certain number of years—the period varies in the different societies from seven to twenty years—to the co-operative dairy, and to observe a certain number of rules as to feeding of cows, treatment of milk, utensils, and so on. Infringements of these rules are punishable by fine, but such cases are of very rare occurrence. Each member signs an agreement drawn up in the above sense, binding himself and his farm to the observance of the rules therein contained. It thus follows that if a farm changes hands during the period for which the farmer has become a guarantor, the liability rests on the new owner.

Number of Creameries in Denmark in 1908.—The figures for the year 1908 show that there were in all 1,345 creameries in Denmark at the beginning of the year. Of this number thirty-three belonged to private persons (Heeresgaards-mejerier), 211 were communal dairies (Faellesmejerier), and the remainder, 1,101, were co-operative dairies.

Associations of Co-operative Dairies.—The greater number of these dairies are again associated in various ways. The most comprehensive of these associations is, perhaps, the Committee of the Federated Danish Dairy Associations (De samvirkende Danske Mejeriforenings Forretningsudvalg). This Committee, which was founded in 1899, consists of the Presidents of the Associated Dairies' Unions of Jutland, of Zealand-Lolland-Falster, and of the Funen Dairies' Associa-

The elections hold for a year. The committee appoints a manager, who is generally paid a lump sum yearly, out of which he has to pay the employees and himself. This system has many obvious disadvantages, and it is not unlikely that it will in time be changed. The manager, besides engaging the employees and supervising the working of the dairy, has to keep the books and generally control the whole business of the undertaking.

Fittings of the Creamery.—The creamery is almost invariably supplied with steam-driven centrifugal machines, and has one or more separators and pasteurisers, according to the amount of milk dealt with. The machines generally drive an electric plant and a cooling apparatus. All utensils are very carefully cleaned, as are the milk cans before their return to the farmer. Most of the machines and utensils appear to be of Danish manufacture, but English and German marks are sometimes seen. Great attention is paid to cleanliness in every department, and the farmers also are required to observe a very high standard in this respect.

Cartage of Milk.—The cartage of milk is generally done by the dairy society, who, in most cases, let it out to a contractor. The dairy charges the farmer so much per hundred pounds of milk. These charges vary from three to ten öre (rather less than ½*d.* to about 1⅓*d.*). The farmers are bound to deliver the milk on the main road, where it is collected by the carrier. It is a common sight in Denmark to see two or three milk cans standing by the side of the road for the carrier to pick up. These cans hold a hundred pounds of milk, and are supplied by the dairy.

Treatment of the Milk.—The milk is weighed on receipt at the creamery and entered to the subscriber's account. Payment is made according to the amount of butter-fat contained in the milk. Every dairy makes regular tests of the milk supplied by its subscribers, and any falling below a certain standard is immediately notified to him, and if the fault is not remedied his milk is refused. Great care is also exercised to prevent milk from any diseased animals being sent to the creamery. Some co-operative societies even go the length of undertaking partially to indemnify a subscriber who sus-

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to endeavour to concentrate and unite the efforts of the various societies in all matters connected with dairy association. The State, in the yearly budget for 1907–8, granted the Committee Kr. 4,000 (£222) towards the expenses of butter exhibitions, and Kr. 1,000 (£55) for the wages of a consultant in the control of the dairies.

Taking next the local associations of dairies, the Presidents of which form the Committee above-mentioned, we find the Associated Dairies' Union of Jutland, composed of all the thirteen minor dairy associations of the peninsula, who again have as members 504 dairies. The object of this association is to form a connecting link between the various dairy associations of Jutland, and in general to further the interests of the dairy industry by holding butter competitions, exhibitions, giving advice, and so on. Each dairy association pays a yearly contribution calculated upon the amount of milk dealt with (in the year 1907–8 this contribution was Kr. 3 (3*s*. 4*d*.) per million pounds of milk), and each association sends one representative for each seven dairies of the association. The Union has a yearly budget of Kr. 14,000 (£777). The subscriptions amount to Kr. 6,000 (£333). The State contributed Kr. 6,650 (£369), which was expended in securing the services of an expert as consultant, in arranging butter exhibitions, and generally in forwarding the production of milk and butter.

The Associated Dairies' Union of Zealand and Lolland-Falster has a membership of five dairy associations—or in all 140 dairies. The Dairy Association of Funen is composed of 145 dairies. Both these associations have generally the same object as the Jutland union above-mentioned.

Election of the Boards of Co-operative Institutions.—As a general rule all associations in Denmark coming within the scope of co-operation are controlled by a committee and chairmen elected for different lengths of time—usually for a year. It has been found that it is better to keep such committees separate, and as a consequence we find a number of such boards—in the smaller districts and villages often composed of the same men—directing different undertakings in the various branches of agricultural co-operation, and

The contributions to the dairy associations are generally based on the amount of milk dealt with; in the case of the dairies themselves sometimes on the number of cows belonging to the subscriber, sometimes on the amount of milk; while in the case of bacon factories the subscription is, as a rule, regulated by the number of hogs slaughtered, the subscriber in this latter case generally guaranteeing a fixed sum.

Larger Product of the Cows on Smaller Farms.—The average yield of milk from cows on farms of the two smallest classes is considerably higher than that on larger farms. This is probably largely due to the fact that on the smaller farms the number of cows kept is proportionately fewer, and the farmer is consequently able to attend to them personally and more thoroughly than is possible on a larger scale.

Control Societies.—In 1895 a new departure was made in agricultural associations, by the formation of the first Control Society (Kontrolforening); the number had increased to 479 in 1907, with an aggregate membership of about 12,000. These societies are aided by the State, the subvention in 1906–7 being Kr. 120,000 (£6,666).

Formation of Control Societies.—Though not actually co-operative undertakings, these societies are formed on co-operative lines by the farmers in various districts. A membership of eight is necessary before the society can receive State aid, though this aid may be refused by the Minister of Agriculture in certain circumstances.

Object of Control Societies—Improvement of Breed of Cattle.—The principal aim of these societies is to improve the milk-producing capacities of the breed of cattle in Denmark. With this object an expert is appointed as controller (it is calculated that one controller can look after about 1,000 cows). This officer travels from one farm to another in his district and gives the farmers advice as to the cows they should select for breeding purposes, and the bulls to which it would be best to put them. The farmer has to keep a record of the weight of milk yielded by each cow, and of the butter-fat contained therein, together with details as to the amount and nature of the fodder supplied to the cow. By this means the controller is able to advise as to the profitableness of the animal. The practice of breeding only from such

cows as are good milkers is said to be tending towards the production of a breed possessing unusually developed capacities in this direction.

Other Functions of the Controller.—Beside the main object of improving the breed of cattle, the controller also gives advice on other branches of agricultural industry, such as the pigs, roots, &c. He also keeps duplicate account books for each farm, being both auditor and adviser to the farmer.

Co-operative Bacon-curing Factories.—Second only in importance to the dairying industry in Danish agricultural life is the bacon-curing industry. In 1887 the import of Danish pigs in a living state into Germany was prohibited, and the Danish farmer saw himself obliged to look for another market. One or two old-established firms in Copenhagen had for some years been dealing with the British market in salted bacon, and hence the first inclination was towards Great Britain. These firms were private concerns, and used the opportune excess of supply over demand to reduce the price given to the Danish farmers for their pigs, while maintaining to a very large extent the price to their customers in London. This state of things was eminently unsatisfactory to the farmer, who, having the success of the recently started co-operative dairies before his eyes, decided to experiment in co-operation in this branch of agriculture also, and the first co-operative pig-killing and bacon-curing factory in Denmark was founded at Horsens in 1888. A certain amount of difficulty was experienced at first, the established private firms naturally offering much opposition, and the experience gained in co-operative dairying being only to a slight degree applicable to this new departure.

Growth of the Movement.—Despite various obstacles, the success of the movement was assured from the beginning. Eight new co-operative factories were established in the second year of the movement, and the number has grown yearly since. The number of co-operative pig-killing and bacon-curing factories in 1908 was thirty-six, with a membership of about 95,000. (Besides these co-operative factories there were twenty-four private firms, so that the total number of enterprises in this branch of the industry was sixty.)

Constitution and Organisation of Co-operative Pig-killing

operative pig-killing and bacon-curing factory is, *mutatis mutandis,* materially the same as that of a co-operative dairy. The area over which the members of a co-operative slaughtery are scattered is naturally larger than that covered by a dairy. The consignments to the factory are neither daily, nor in small quantities, as in the case of dairies, but at longer intervals and in larger quantities. Again, the perishable nature of milk necessarily limits the distance over which it can be transported, while with the live pig this is not the case. The risks of transport are borne by the factory once the pig has been consigned; moreover, the factory bears the cost of transport for such pigs as are sent by train, so that all pigs, whether from far or near, arrive at the factory at an equal minimum of cost to the farmer.

The money for erecting the factories was raised by loans, as in the case of the dairies, the guarantee being in this case also for a certain number of years, generally five, seven, or ten. In most cases the original loans have already been paid off, and the factories are owned by the members themselves. The members bind themselves to deliver all their pigs to the factory (generally with the exception of the sows and hogs for breeding purposes and young pigs under a certain weight). They may, however, sell to a fellow-member, upon whom the obligation towards the factory devolves. Special rules are made as to the admittance of new members subsequent to the foundation of the factory.

The members elect their committee, which in turn elects its chairman and vice-chairman, and appoints a director of the factory, and in some cases certain other officials. The director manages the factory under the control of the committee.

The Associated Danish Co-operative Pig Slaughteries.—This association (De Samvirkende Danske Andels-Svineslagterier) was founded in 1897, and thirty-three out of thirty-six co-operative slaughteries in Denmark belong to it. It consists of members of the committees of all the associated factories, who elect a committee of five of their members, who stay in office for two years, and of two factory directors, who hold office for a year. The expenses of the association are divided among the associated factories in proportion to the number of pigs they have slaughtered, and varies from one to two öre per pig—in all about Kr. 15,000 (£833).

The objects of this association are to represent the interests of the industry as regards legislation, to secure the best information as to transport of and demand for slaughter-house products, to work for the improvement of Danish bacon by affording the assistance of scientific consultants, &c., and to promote rational pig breeding. (There are other associations for the improvement of the various breeds of pigs, some of which are assisted by the Government but which are not co-operative in their constitution.)

A very important function of this association is:* "To diffuse immediately the latest intelligence regarding the bacon industry among those concerned." The endeavour to introduce a common quotation of prices for bacon produced in Denmark has only met with partial success up to the present. The abattoirs of Jutland and Funen have established a board which, on the receipt of biweekly dispatches from England, fixes the price as far as these abattoirs themselves are concerned. The Zealand and Lolland-Falster markets are, however, somewhat influenced by the neighbourhood of Copenhagen, and it has hitherto been found impossible to establish a general quotation for the whole country. The association, however, keeps its members informed of the state of the market and of the number of pigs slaughtered in Denmark and Ireland, so that a very good idea of the prices can be formed by the factory directors.

The action of the association in having a scientific veterinary expert at the disposal of its members (the Government have made a grant of Kr. 2,000 (£111) yearly towards the expenses of this expert) has contributed largely to the success of the Danish bacon industry. The Agricultural High School has also placed its laboratory at the disposal of the association for purposes of experiment.

It is also due to the association that the veterinary control of exported meat, which was regulated by the Law of July 29th, 1903, was recently revised, and that the standard was so raised that foreign customers of Denmark can be certain that they receive nothing but absolutely sound meat.

* Vide the "Report on Co-operative Agriculture and Rural Conditions in Denmark," published by the Department of Agriculture and Technical Instruction for Ireland, 1905.

In the Reports to the Board of Agriculture and Fisheries which accompany Parts I. and II. of the Agricultural Statistics for 1910, Mr. R. H. Rew, the assistant secretary in charge of the work, makes an examination of the condition of British agriculture in the first decade of the twentieth century as compared with the last decade of the nineteenth, and in Part III. (Cd. 5786, price 9*d.*) of these statistics, which has recently been issued, this comparison is continued as regards prices and supplies.

Changes in Agriculture and Agricultural Prices in the last Twenty Years.

Summarising briefly the principal points, it may be said that as regards area the figures show a reduction of the cultivated land of the country by about half-a-million acres in the course of twenty years, the loss of about 1½ million acres of land under arable cultivation being only partially compensated for by laying down a million acres to grass. The acreage of corn crops has been substantially reduced, but the area of potatoes has been maintained, and indeed increased, while fruit cultivation has extended very markedly. The crops of the decade 1901–10 were on the average considerably better than those of 1891–1900, and consequently the effect of reduced acreage on total supplies was somewhat diminished. Cattle increased in numbers, cows and heifers more largely than other classes, though the increase was only small, and represented, in relation to the growth of population, a serious falling off. Attention is directed to the significance of the failure of the milking herd of the country to keep pace with the steadily increasing demand for milk. Notwithstanding a reduction in the total number of sheep in the country, the maintenance of the stock of ewes indicates that sheep-breeding fairly held its own, though not if considered in relation to population. The numbers of horses and pigs also did not greatly change in the two decades.

With regard to prices, a comparison of the available figures shows that the values of nearly all kinds of British farm produce have, so far as it is possible to judge, been higher in the first decade of the twentieth century than in the last decade of the nineteenth. This will be seen from the follow-

	1891–1900.	1901–10.	Increase + or Decrease –. Actual.	Per Cent.
	s. d.	*s. d.*	*s. d.*	
Wheat ... ...per qr.	28 2	29 10	+1 8	+ 6·0
Barley ... ... ,,	25 0	24 6	–0 6	– 2·0
Oats ... ... ,,	17 5	18 0	+0 7	+ 3·0
Fat Cattle—			*d.*	
First ... .. per 8 lb.	4 7	4 9	+2	+ 3·6
Second ... ... ,,	4 0	3 11	–1	– 2·1
Inferior ... ... ,,	2 7	2 9	+2	+ 6·5
Fat Sheep—				
First ... ... ,,	5 8	5 10	+2	+ 2·9
Second ... ... ,,	5 0	5 0	—	—
Inferior ... . ,,	3 6	3 9	+3	+ 7·1
			s. d.	
Bacon (Irish) ... per cwt.	61 6	66 10	+5 4	+ 8·7
Cheese (*English Cheddar*) ,,	59 5	65 5	+6 0	+10·1
Butter ... ... ,,	99 6	102 0	+2 6	+ 2·5
Eggs ... ... per 120	8 3	8 10	+0 7	+ 7·1
Potatoes ... ...per ton	71 7	76 3	+4 8	+ 6·5

The prices realised by the British farmer for the produce of his land appear to bear in many cases little relation to the quantity which he produces in a particular season. A short home harvest does not necessarily mean high prices, nor does a good crop always mean low ones. Broadly speaking, the influence of the home crop upon the markets depends on the proportion which it bears to the average total supplies, or, in other words, to the imports which compete with it. This is illustrated by a comparison between the annual production of wheat in Great Britain and the average price at which the crop in each year was sold. This shows that though there is in some years an indication that increased home production was followed by a fall of price or reduced production by a rise, the movement is not very close, and very pronounced changes in the production appear to have had a very slight effect upon the price—the home production representing only about 20 per cent. of the whole supply.

A similar comparison for potatoes, the home production of which represents about 90 per cent. of the total supply, shows the relation between prices and supply to be very marked.

The oversea supplies of commodities which directly compete with British farm produce have, it may be noted, all been larger in the decade 1901–10 than in the preceding ten years.

The Annual Reports, by the Chief Veterinary Officer (M
S. Stockman) and by the Assistant Secretary, Animals Div

Reports on the Proceedings of the Board under the Diseases of Animals Acts.

sion (Mr. A. W. Anstruther, C.B.), c
the proceedings of the Board under th
Diseases of Animals Acts, 1894 to 191(
and the Markets and Fairs (Weighin
of Cattle) Acts, 1887 and 1891 for th
year 1910, have recently been published (Cd. 5606, price 1s.)

The Report of the Chief Veterinary Officer consists of general Report on the veterinary work arising from outbreak of foot-and-mouth disease, swine fever, glanders, anthra and sheep-scab, and of a Report on the scientific investig tions undertaken in the Laboratory. The subjects dealt with i most detail refer to a trypanosome of British cattle, bracker poisoning, the warble-fly, and the habits of British tick found on sheep and cattle.

The Report of the Assistant Secretary refers to the ac ministrative measures which were taken during the year unde the Diseases of Animals Acts.

During the year 1910 foot-and-mouth disease again mad its appearance in Great Britain, but the outbreak was fortu nately detected in its early stages, and the infection did nc spread. The number of outbreaks of swine fever fell fror 1,650 in 1909 to 1,598 in 1910, of sheep-scab from 685 to 55(and of glanders and farcy from 533 to 351. On the othe hand, the number of outbreaks of anthrax reported to th Board by the local authorities increased from 1,317 to 1,496.

With regard to foot-and-mouth disease, the fullest inquir failed to establish the source from which the infection in thi instance came. Many clues were followed up, but there wa not sufficient evidence upon which to base an authoritativ conclusion.

The position as regards swine fever generally leaves muc to be desired, and Mr. Anstruther observes that it is not eas to see how any substantial improvement is to be brough about in the near future.

The reduction in the outbreaks of sheep-scab, on the othe hand, is a matter for satisfaction, and the Inspectors of th Board report that the Dipping Orders throughout the countr were, on the whole, well enforced, and that a general feelin

is growing up that the compulsory dipping of sheep is beneficial to the industry for reasons other than those connected solely with the eradication of sheep-scab.

Anthrax was dealt with in a new Order issued in September, 1910, which came into force at the beginning of the present year. In issuing the new Order the Board laid stress upon the fact that anthrax is a disease against which it is not practicable entirely to guard on account of the multiplicity of the channels through which infection may be conveyed. Although the eradication of the disease cannot be aimed at, it is possible to bring it more under control. It is believed that the new Order will be of service in securing the collection of more trustworthy statistics to form a basis upon which to build up any other measures which further experience may indicate as likely to reduce the risk of infection, and that the co-operation of the agricultural community may be relied upon in carrying the new arrangements into effect. The experience obtained during the current year appears to show that more trustworthy statistics are being obtained.

A matter which attracted a good deal of public interest in the preceding year was the exportation of horses to the Continent, and this subject was dealt with by the Diseases of Animals Act, 1910, which enacted that it shall not be lawful, except as provided in the Act and in such cases as may be prescribed by Order of the Board, to ship or to attempt to ship any horse in any vessel from any port in Great Britain to any port outside the British Islands, unless immediately before shipment the horse has been examined by a veterinary inspector appointed by the Board for the purpose, and has been certified in writing by him to be capable of being conveyed to such port and disembarked without cruelty.

The Board's Senior Superintending Veterinary Inspector, in his Report to the Board, states that the persons interested in the trade in horses to the Continent seem now to admit that the changes which have been made have put the trade on a firmer and more satisfactory basis, and that the greater measure of uniformity in administration which has been brought about by the direct intervention of the Central Authority has, on the whole, been beneficial to

discomfort to which horses have in the past been subjected during the voyage is now avoided by the improvement which has been brought about in the vessels used in the trade and their fittings, and the careful attention which is given to the feeding and watering of the horses whilst on board, as well as to their comfort on the voyage.

There is still room for considerable improvement, at some of the ports at any rate, in the provision made for the shelter of horses presented for embarkation and the facilities available for resting, feeding, and watering the horses at the various places of shipment. It is, however, confidently expected that these difficulties will shortly be solved in a satisfactory manner.

IMPORTS OF GRAIN IN THE CEREAL YEAR 1910–11.

THE extent to which this country has been dependent on the Colonies and foreign countries for grain to supplement the harvest of 1910 may conveniently be considered at the end of the cereal year (September 1st to August 31st).

The imports of wheat into the United Kingdom amounted to 23,516,000 quarters, a quantity which, though it failed to reach the import of the preceding year by 580,000 quarters, has only twice been exceeded. The home harvest and the imports of flour were also less than those of 1909–10, so that, converting the flour into an equivalent quantity of wheat, the total quantity of wheat available for consumption in the United Kingdom was 33,854,000 quarters, compared with 35,500,000 quarters in 1909–10. In these amounts seed is included, but not stocks carried over. Similar figures for recent years are given in the following table:—

Harvest Year.	Wheat Crop of the United Kingdom. Qrs.	Imports of Wheat during the Cereal Year Sept. 1–Aug. 31. Qrs.	Imports of Wheat Flour in equivalent Weight of Grain. Qrs.	Total Imported Wheat and Flour in equivalent Weight of Grain. Qrs.	Total estimated Wheat Grain available for home consumption (including seed). Qrs.
1903–4	6,102,300	21,723,820	6,203,350	27,927,170	34,029,470
1904–5	4,740,000	24,529,170	3,526,620	28,055,790	32,795,790
1905–6	7,541,600	22,063,580	4,677,330	26,740,910	34,282,510
1906–7	7,577,300	22,105,180	4,284,490	26,389,670	33,966,970
1907–8	7,066,400	21,362,720	4,339,090	25,701,810	32,768,210
1908–9	6,741,200	21,727,220	3,554,650	25,281,870	32,023,070
1909–10	7,899,600	24,099,060	3,501,520	27,600,580	35,500,180
1910–11	7,074,200	23,516,140	3,263,380	26,779,520	33,853,720

Vith regard to the countries from which the supply of wheat /as drawn, the receipts from each of the principal sources of mported wheat are given below :—

Country of Export.	Thousands of cwt.			
	1910-11	1909-10.	1908-9.	1907-8.
India	21,460	16,077	10,904	10,480
Russia	25,728	27,911	9,470	4,455
Argentina	16,983	11,405	24,542	28,128
United States	9,479	14,911	19,299	25,273
Canada	13,826	18,539	15,118	13,578
Australia...	10,417	11,915	9,587	6,264

India, Russia, Argentina, and the United States have, uring the last four or five years, been substantially on an quality as regards exports to this country, any deficiency 1 the supplies from one being made up by the others. 1 1910–11 there was a set-back to the steady increase shown y Canada in recent years, while on the other hand the de-easing tendency exhibited by the United States was well aintained. The imports of wheat from Argentina, although reater than in 1909–10, were still much below the level of me former years, the decrease compared with 1907–8, for stance, being 11,000,000 cwt. The receipts from Russia, dia, Canada, and Australia were high, but in no case so igh as in some former years.

With the large total quantity of wheat available in the ist two cereal years, the average price has steadily declined om the high level of 1908–9. The average declared value the imported wheat was 33*s.* 10*d.* per quarter, compared ith 37*s.* 5*d.* in 1909–10, and 39*s.* 1*d.* in 1908–9. The average ice of British wheat only in three weeks of November fell low 30*s.* per quarter, but it kept very close to the 30*s.* line, d the average for the harvest year was only 30*s.* 11*d.* per arter, compared with 32*s.* 6*d.* in 1909–10, and 36*s.* 6*d.* in 08–9. This is, however, far from being a return to the w prices generally prevailing up to 1906. English barley eraged 24*s.* 9*d.* per quarter, or 11*d.* above the average for e preceding year, and oats at 17*s.* 8*d.* showed no change. The following table shows the average prices of English

given in the table are the quantities returned as sold, from *which the averages are calculated*:—

Harvest years.	Prices per quarter.						Quantities sold at certain markets.		
Sept. 1–Aug. 31	Wheat.		Barley.		Oats.		Wheat.	Barley.	Oats.
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	Quarters.	Quarters.	Quarters.
1901–02 ...	28	4	25	11	20	4	2,451,275	3,176,599	698,840
1902–03 ...	26	5	23	4	17	8	2,386,017	3,151,337	1,104,660
1903–04 ...	27	2	21	10	16	4	2,129,448	2,780,473	1,132,086
1904–05 ...	30	7	24	6	17	0	1,746,927	3,141,058	1,178,154
1905–06 ...	28	9	24	2	18	5	2,940,263	3,202,613	940,015
1906–07 ..	28	1	24	5	18	4	2,830,991	3,376,615	1,219,419
1907–08 ...	32	9	25	8	18	2	2,944,256	3,564,908	1,530,848
1908–09 ...	36	6	26	11	18	10	2,962,825	2,972,889	1,054,318
1909–10 ...	32	6	23	10	17	8	3,144,873	2,988,483	795,824
1910–11 ...	30	11	24	9	17	8	2,799,763	2,992,128	831,898

The receipts of flour have, on the whole, been declining since 1900–1, when the quantity imported was 23,000,000 cwt. The United States formerly supplied almost the whole of the flour imported into this country, but side by side with the decrease in the imports of American wheat a great drop in the supply of flour from this source has taken place. Receipts from Canada, the only other country sending any considerable quantity, have increased fairly steadily, but no country has, except temporarily, taken the place of the United States. In 1910–11 the United States sent 5,343,000 cwt., and Canada 2,970,000 cwt., while Germany and Australia each contributed nearly half a million cwts.

The imports of barley differed little from those of the previous year. Oats have fluctuated considerably in recent years, and after rising steadily to 19,600,000 cwt. in 1909–10 from a drop to only 10,900,000 cwt. in 1906–7, fell back in 1910–11 to 16,642,000 cwt. The decrease is chiefly due to smaller receipts from Russia and Germany. Of the total quantity of barley available for consumption in the United Kingdom, on the average less than a half is imported, while of oats only about one-fifth is imported, and in the case of both these cereals there has been no tendency to an increase in the imports for many years.

As regards maize, the 45,951,000 cwt. received showed a recovery from the relatively small imports of 1909–10 (34,642,000

The aggregate imports of the principal cereals in each of the past seven years are given below:—

Harvest year.	Millions of cwt.				
	Wheat.	Wheat Meal and Flour.	Barley.	Oats.	Maize.
1910–11	100·8	10·1	20·1	16·6	46·0
1909–10	103·3	10·8	19·9	19·6	34·6
1908–9	93·1	11·0	22·0	15·5	39·0
1907–8	91·6	13·4	17·5	13·2	39·5
1906–7	94·7	13·2	19·5	10·9	51·7
1905–6	94·6	14·4	20·3	16·0	47·1
1904–5	105·1	10·9	21·0	17·2	42·3

The International Agricultural Congress at Madrid.

A preliminary statement as to the Madrid Agricultural Congress, which was held in May last, appeared in the JOURNAL for July (p. 317). The following detailed summary of the proceedings is based on an article by M. Henry Sagnier, the distinguished Editor of the *Journal d'Agriculture Pratique*, which he published in that periodical, and which he has most kindly permitted the Board to utilise.

The work of the Congress was distributed among eight sections, dealing with the following groups of subjects:—(1) Economics; (2) statistics; (3) surveys; (4) forestry; (5) viticulture; (6) fruit culture; (7) breeding of live stock; (8) manures. Material for the work of the sections was provided by preliminary papers, the conclusions arrived at in which were discussed, and formed a basis for the resolutions that were to be the final outcome of the Congress.

Of these resolutions some consist of recommendations, for submission to the Governments concerned, with regard to possible reforms; others are suggestions to landowners with respect to improvements that can be introduced in the cultivation of the soil. The permanent commission of the congress is charged with the duty of transmitting to the International Institute of Agriculture, at Rome, the resolutions having an international object, with the furtherance of which it is con-

importance, and the programme was particularly full, more than twenty-five papers being submitted for consideration.

The first question dealt with was the means of keeping agriculturists on the land, including in the term landowners, farmers, and labourers. The problem has many aspects, and it arises in different forms in different countries. Among the six papers on this question that were presented, one of the most important was that of the Comte de Montornés, on a plan for the management of a large estate, which has been put into operation in the province of Valencia.* M. H. Hitier contributed an interesting paper, which was much appreciated, on the provision of suitable housing accommodation as a means of keeping agricultural labourers on the soil. Finally, the section recommended a series of legislative measures designed to facilitate the creation of small holdings, to foster co-operation and all movements directed towards the promotion of the general welfare. It insisted, also, on the advantage that would result from a reduction in the excessive subdivision of holdings. It also pointed out the advantage to municipalities, in conjunction with large landowners, of forming "back to the land" committees, for the purpose of facilitating, where desirable, the return of agricultural families to the soil.

The second subject related to agricultural education, and papers were contributed by M. H. Grosjean, on the agricultural instruction to be given to the rural classes in France; by M. Westermann, on agricultural education in Denmark; and by M. Paul de Vuyst, on associations for women agriculturists in Belgium.

Co-operation and agricultural credit formed the third subject dealt with. The conclusions arrived at were mainly of a general character. The section insisted strongly on the necessity for freedom in the creation and development of agricultural co-operative societies, especially those for the purposes of supply, production, and sale. Suggestions were made in regard to the organisation of credit societies that will be useful in countries where such societies are not numerous.

Questions relating to water supply are of the first importance in Spain, and numerous papers on the subject were contri-

* A translation of the Comte de Montornés' paper appeared in the *Journal*, August, 1911, p. 394.

buted. These dealt especially with State intervention in irrigation. In that country the demand is unanimous that the State should supply at the proper times the water that is indispensable for agricultural operations. To this end the establishment of a hydrological department is advocated, for the purpose of surveying and improving the water supply. The principle of subventions in aid of the construction of irrigation canals was approved on the ground of the eminently productive character of such undertakings, and assistance was asked, not only for new undertakings, but also for the extension of those already existing. In addition to the utilisation of surface streams, the investigation of underground sources of water was included.

The section also considered the question of weirs and the use of water power for electric power stations, undertakings that have a direct effect on the water supply for agricultural purposes. On this subject M. Léon Dabat presented a paper on the distribution of electric power, the conclusions of which were adopted by the section. They may be summarised as follows:—In granting concessions for the use of water for the purpose of electric power works, the concessionaires should only be allowed to charge a certain price for the sale of power for raising water for purposes of general utility, particularly for irrigation, sanitary purposes, drinking water, &c.

Statistics.—The second section dealt with the collection and use of statistics. The discussion resulted in a series of resolutions in the following terms:—

1. That an official statistical department should be organised in every country for the purpose of providing farmers with all the information they require to enable them to arrange their production, and that sufficient financial resources should be placed at the disposal of this department. It should be arranged that the statistics should be published as often and as rapidly as possible.

2. That legislative or administrative means should be taken in each country to verify and publish as frequently as possible, not only the prices actually current for the products of agriculture and agricultural industries, but also the quantities offered and sold at each rate quoted in the official lists.

3. That the International Institute of Agriculture at Rome should be recommended to continue the plan which it has adopted of putting at the disposal of the world the statistical material transmitted to it by the various Governments, and to develop, on as extensive a scale as possible, the series of statistical inquiries at present in course of publication.

4. That, in order to facilitate the comparative study of the statistics of different countries, relating to the trade in the products of agriculture and agricultural industries, standards of quality should be established in each country, which would serve as a basis for comparison. The Congress suggested that the International Agricultural Institute at Rome should examine this question, with the object of defining useful types.

5. That for the most important crops, cereals, for example, the reports published should begin at the earliest stage of growth, and should be published every month, up to the time immediately preceding the harvest.

Surveys.—The third section, dealing with surveys, adopted only a series of general recommendations, dealing with the methods of official surveys, their advantages and disadvantages, &c.

Forestry.—Numerous papers were presented to the forestry section, which was one of the most active sections of the Congress. The nature of the discussions is shown by the following general conclusions which were adopted :—

The progress of agriculture and stock-breeding requires, as an indispensable preliminary measure, the reafforesting, and subsequent conservation and management, of all the mountainous districts in the forest zone.

At present the mountainous districts fail to exercise their normal and natural action on the climate, the water system, and the economy of the country.

The forestry administration should divide the mountainous districts forming the forest zone into two main groups, viz., protective and productive areas. The freehold of all land included in the area of protective mountainous districts should be acquired by the State, and immediate steps taken for a soil survey, and the reafforestation and management of such land.

The State should exercise technical and administrative control over all mountainous areas that are the property of villages

or public bodies. They should be preserved, as being productive, though not protective, by the fact of being included within the forest zone. Over the remaining mountainous districts included in the forest zone and held as private property, the State should only exercise a technical inspection, sufficient to ensure their proper maintenance and improvement.

The State should proceed to the delimitation of the forest zone, and to the classification of the mountainous regions included in it into protective and productive areas, and declare them of public utility.

It was suggested that one of the most important aims of the Congress should be the conclusion of international conventions as a means of arriving at the formation of an international code on the reafforestation of mountains. A union should be established of the States bordering on the Mediterranean for the solution of the forestry problems of the region.

The various States, by example and precept, by moral and material support, and by fiscal immunities and legislative provisions designed to attract private or collective capital, should promote the maintenance and improvement of existing forests, the management, as regards forestry and grazing, of mountains, and the reafforestation of waste lands.

The State should, by various means, increase the wooded area, and maintain and improve the Alpine pastures. To this end it should strive to increase the public forest area, and to stimulate the formation of associations for the purpose, by attracting capital towards afforestation, at the same time preventing undue exploitation.

It will be necessary, in connection with rivers having an international character, that the work should be carried out on a method drawn up by agreement among the countries interested, each engaging to follow the plan as far as its financial resources and circumstances will allow.

Steps should be taken to popularise the view that agriculture will derive great benefit by the partial substitution of forestry for cultivation where the conditions are unfavourable for the latter, by increasing, in dry regions, the numb wooded pastures, and by dividing arable fields by lin trees at right angles to the direction of the prevailing win

an educational character. Societies for the promotion of tree-planting and forestry should be encouraged.

Viticulture and Fruit Growing.—The fifth section of the Congress was devoted to viticulture and wine-making, and, in view of its importance in the southern countries of Europe, the subject naturally attracted much attention. The sixth section was devoted to fruit trees, and also chiefly concerned itself with fruits grown in Southern Europe, such as the orange, lemon, and olive.

Insects and fungi attacking these trees were the subject of two reports, and, taking as a basis the results which have been attained in the U.S.A. by the introduction of certain useful insects parasitic on harmful insects, the Congress expressed the desire that entomologists in the different countries should request their respective Governments to undertake the study and classification of these useful insects, and to facilitate the exchange of colonies of these insects with countries where insects which they destroy are prevalent.

Live Stock.—In the seventh section, the feeding of cattle was the most important consideration. The Congress expressed the desire that the procedure with regard to the analysis of feeding stuffs for animals in different countries should be made uniform, and that tables of feeding values for different districts should be drawn up, showing the great differences between the nutritive value of products according to their place of origin. Such tables should be brought together in pamphlet form, for distribution to breeders, and should include typical model rations for different animals by districts.

Another resolution asked for uniformity in sanitary regulations relating to animals, and the spread among agriculturists of a practical knowledge of the hygiene of animals.

The section also dealt with methods of treatment of grassland, and asked for the creation of organisations whose special duty it would be to act as intermediaries for the purchase of seeds, of which the quality should be guaranteed.

Manures.—The object of the eighth section was to collect information on the application of new manures produced by

clusion was arrived at that nitrate of lime and calcium cyanamide are nitrogenous manures well deserving the attention of the whole agricultural world, though more experiments with these manures must be undertaken in order to ascertain exactly how they should be used.

The other conclusions relate to comparisons between the action of these two manures. The section concluded that nitrate of lime acts similarly to nitrate of soda, while calcium cyanamide appears to behave like sulphate of ammonia.

The Evesham Custom.

The occupation of land for market gardening purposes in ie neighbourhood of Evesham is subject, as regards tenant right, to what is known as the "Evesham Custom," and just as in agricultural districts the incoming tenant pays the utgoing tenant for the crops, so the incoming tenant in the vesham district pays the outgoing tenant for the fruit.

There are often apparently no clauses in the tenant's agree-ent with the landlord enabling the former to claim com-ensation for improvements, although a witness before the ommittee on Fruit Culture stated that the custom had been ifficiently long in force to come under the rules of custom of e country. In fact, so strong is the custom that in many aces farms and holdings are let without any lease or agree-ent of any sort whatever, and landlords feel perfectly secure ıder the custom.

The following note as to the working of the custom at the esent time has been supplied to the Board by Mr. J. Henry ıbin:—

"The 'Evesham' custom with regard to compensation for arket gardening is based on a system of practically 'fixed' nts and 'free sale.' Under this custom notice to quit is ldom, if ever, given by a landlord, but a tenant leaving ıds a purchaser for his 'improvements,' and arranges the ice to be paid, including the value of items that he would t be entitled to claim under any statute, such, for instance, ıs buildings put up without the consent of the landlord.

"This custom has worked well. During more than twenty- ... rs, during which I have had the management of a

large number of allotments and small areas cultivated as market gardens, not a single tenant has made a claim against the landlords, although changes have taken place.

"The name of the proposed transferee is submitted to the landlord, who makes the necessary inquiries as to his means, &c. Occasionally the incomer seeks to make better terms as to rent, or asks that the landlords shall take the fixtures on payment of interest on their ascertained value, while in some cases recently the outgoer has represented that he could not secure a good customer on account of the rent being somewhat more than times permitted; but a very moderate reduction has usually met the case, and this has not been given until the terms of the proposed transfer have been disclosed.

"The custom is well recognised in the district, and works well. It keeps up the standard of cultivation, as good clean gardens are sought for and command a good price; but there are signs of an intention to ignore it. The Market Gardeners' Compensation Acts were strongly urged to be necessary by gardeners in the Evesham district, but I believe that they were principally newcomers who were 'making' their gardens and feared disturbance."

Information with regard to the "Evesham Custom" is given in some detail in the Minutes of Evidence of the Royal Commission on Agriculture, 1893 (C. 7400—III.), and of the Departmental Committee on Fruit Culture (Cd. 2719).

Promotion of Agriculture by Railway Companies in the United States.*

Railway companies in the United States have a vital interest in the development of agriculture in the districts through which their lines pass, since any increase in agricultural production means an increase in the amount of produce carried to the towns, with a corresponding increase in the supplies furnished from the towns for the upkeep of the agricultural industry and a probable extension in passenger traffic owing to the growth in the rural population. An idea of the im-

portance of the traffic in agricultural produce in the United States may be obtained from the fact that in the year ended June 30th, 1909, 191,381,772 tons of such produce were carried by the railway companies, the receipts for which amounted at a very low estimate to £76,000,000, or probably well over 22 per cent. of the entire receipts of all the companies for goods traffic.

It appears from an inquiry recently made by the Office of Experiment Stations of the United States Department of Agriculture, that out of 103 railway companies, fifty-two of them were engaged to a greater or less extent in rendering assistance to the agricultural interests of their districts. It is recognised that in order that a railway company may profit to the fullest extent from the agriculture of the districts served by its lines, it must, in a new and undeveloped country, do more than construct railroads and carry goods—that is, it must itself take steps to encourage and promote the industry on which it mainly depends.

Agricultural Instruction Trains.—This method of assisting agriculturists is widely used by railway companies, and fifty-two of the leading railway companies in the United States and Canada were engaged in this form of disseminating information in 1910.

The method followed has been for each company to provide at its own expense a locomotive, luggage van, one or two coaches fitted up for lecture purposes, together with a car provided with dining-room and sleeping accommodation for the lecturers. The latter are usually furnished by the agricultural college or experiment station of the state in which the train is run, and are sometimes supplemented by specialists from the national and state departments of agriculture. Each train is equipped with material to illustrate the instruction to be given, *e.g.*, if the instruction is to be in dairying, dairy cattle are frequently carried, together with dairy apparatus. The train is advertised in advance by means of posters and newspaper notices giving the hour at which it will arrive at each stopping-place, the length of time it will

or forty minutes. Pamphlets on the subject are usually d
tributed free.

The fifty-two trains employed in the year 1910 cove
40,771 miles and made 1,793 stops of from forty minutes
two days each. The total cost of running the trains is e
mated at £19,000, and the total number of people attend
the lectures at 379,000.

Experimental Farms.—Eight railway companies have
tablished thirteen demonstration farms to show the capab
ties of the soils and climate of the districts in which they
situated. One farm is situated on marshy land, wh
drainage was necessary before the soil could be utilis
others have been established on sandy land generally
garded as worthless for agricultural purposes, on so-cal
exhausted lands, and on semi-arid lands, the object being
encourage settlement in these less desirable districts.

Organisation of Agricultural Associations.—One comp
has organised thirty-five associations, with an aggreg
membership of 5,000 persons. This company notifies
associations promptly of changes in the demand for produ
and gives advice as to the localities where profitable mark
exist. Another company in the southern United States,
addition to keeping the associations and individual grow
informed daily during the season of the exact condition
the markets, undertakes to divert consignments *en route*
the direction of the consignor, *e.g.*, the consignor, a
despatching his goods to a particular market, may be advi
of a glut in that market, and on his telegraphing to the r
way company the latter will divert the goods to another
less congested market chosen by the consignor.

Results Obtained.—All the railway companies say t
are satisfied with the results of their efforts. One case is m
tioned where 3,500 waggon loads of fruit and vegetables
now sent over the lines of a company, as compared w
practically nothing five or six years ago. In other cases
only has there been a large increase in the production
staple crops along the railway, but also an increase in f
and vegetable growing of fully 100 per cent. in the last
years. In one locality adapted to

the farmers how to plant and grow this fruit. In the first year 86 acres were planted, with a yield of nine waggon loads. In 1904 about 1,000 acres were planted, and fifty waggon loads were despatched; and this increased two years later to between 250 and 300 loads.

School of Working Foresters, Forest of Dean.

The Board have been furnished with the following statement respecting the Forest of Dean School of Forestry, which has been prepared by Mr. C. O. Hanson, with the consent of the Commissioners of H.M. Woods and Forests:—

Previous to the year 1904 there was no school in the United Kingdom where young working men who desired to take up forestry as a business could be taught both the theory and practice of the subject. In that year the Commissioners of Woods and Forests started a small school in the Forest of Dean, which has since annually trained a small number of men to be foresters or woodmen.

The Forest of Dean is a very suitable locality for this purpose, as there is an area of some 24,000 acres of forest in the neighbourhood, including the Crown Estates of Highmeadow and Tintern, in addition to Dean Forest itself. These woods are worked in accordance with proper working plans. They are situated at all elevations up to 900 feet, and on many varieties of soil and aspect. The students can thus become familiar with the growth of trees under many conditions.

The school is essentially one for working men, and at present the number of students admitted in any year is limited to twelve, and these must ordinarily be between the ages of twenty and twenty-five years, though occasionally a student rather younger or older will be admitted for special reasons. There are no examinations for admission, but the students are chosen from amongst those who apply, the preference being given to young men who have already worked in woods or nurseries or at other work upon the land and who are well recommended by the land agent or

regulations as Crown workmen and under the orders of the Crown woodman of the district to which they are sent. The school usually works in one gang under the immediate supervision of a foreman, who is an old pupil of the school. The ordinary hours of work are from 7 a.m. to 5 p.m., with half an hour for breakfast and one hour for dinner. In winter the hours are from 7.30 a.m. to 4.30 p.m., with half an hour for breakfast and again for dinner. Every alternate Saturday is a half-holiday. Usually the students spend two afternoons a week, from 1.30 to 4 p.m., with the instructor in the classroom, and occasionally go out with him for walks and excursions in the woods for the whole day.

The students are paid at the rate of 15*s*. a week, or 2*s*. 6*d*. a day, but do not get paid if, owing to bad weather or other cause, no work is done. The time spent in school is counted as work, and is paid for.

The education is free, and is designed to make a student thoroughly qualified to act as forester on any estate in the United Kingdom. The instruction given includes sylviculture, forest protection, forest mensuration, management and simple working plans, the felling and conversion of timber, elementary botany and surveying, arithmetic and simple accounts.

With regard to practical work in the forest, the students work in the nurseries at sowing, transplanting, trenching, weeding, and grafting; in the forest they work at planting, clearing, pruning, thinning, stripping bark, felling, and measurement of trees both felled and standing. Fencing, hedging, and draining is also done as far as is possible in connection with the ordinary routine of the forest work. In addition, each student works in the carpenter's shop for two or three months at gate-making and other rough carpentry.

The progress made is periodically tested by examinations both in the classroom and forest, the final examination being conducted by the Consulting Forester to the Commissioners of Woods. To all who satisfy the examiner a certificate, signed by the Commissioner of Woods and by the Deputy

course is given by the Crown, but an endeavou
find suitable situations for the men. Up to date no difficulty has been found in doing this, as is shown by the following statement, which also gives some indication of the prospects for passed students:

Number of students who have received full certificates from 1904 up to June, 1911=40.

Present situations occupied by the above:—

Forester in Uganda	1
,, ,, East Africa...	1
Assistant Pole Inspector, Postal Department	1
Head Forester, War Office Estates	1
,, Private Estates	2
Woodmen in Crown Forests	5
Foresters or Woodmen on Private Estates	15
Workmen in Dean Forest	9
(Most of the above, on leaving Dean Forest, start at about 25*s.* per week with usually a house or lodgings in addition.)	
Other positions connected with forestry	2
Positions not connected with forestry...	3
	40

The eight men who left the school last October all obtained situations within two months of leaving, and there are at present seventeen men at the school, of whom nine will leave in the present month. Of these only two have not as yet been provided for (September 1st).

The school buildings, which are situated at Parkend, consist of a classroom and large museum, where an interesting collection of exhibits connected with forestry is displayed; a dormitory for eight men, and a living room. In the same building are an institute and a miniature rifle range under separate management, which the students can use if they care to pay the subscription to become members of the two clubs. Board, lodging, and washing is given at the school for 11*s.* a week, the first year students being given lodgings here. After a year they move into private lodgings, which are obtainable at Parkend for about the same sum. A careful student can thus manage on his pay, but a small allowance is often given by parents or others.

The school course extends over two years, and the next class will be admitted in October, 1911. All applications for admission should be made without delay to V. F. Leese, Esq., Deputy Surveyor, Whitemead, Parkend, near Lydney,

SUMMARY OF AGRICULTURAL EXPERIMENTS.*

SOILS AND MANURING.

Calcium Cyanamide and Nitrate of Lime (*Jour. Roy. Hort. Soc., Vol.* 36, *Pt.* 3, *May*, 1911).—These two nitrogenous manures were tested in comparison with nitrate of soda and sulphate of ammonia by Mr. F. J. Chittenden in 1908–10. The crop grown was turnips, and the site of the trials varied each year. Nitrate of soda was used at the rate of 4 cwt. to the acre, and the other nitrogenous manures in such quantities that each plot received the same weight of nitrogen. The land was also dressed with superphosphate and kainit. The best yield was given by a different manure each year, but the total crops for the three years in each case were very similar, viz.: Nitrate of soda, 227 lb.; sulphate of ammonia, 239 lb.; calcium cyanamide, 241 lb. It thus appears that for supplying nitrogen over the whole growing period of the crop there is little to choose between these three.

Manuring of Meadow Hay (*Cumberland and Westmorland Farm School, Newton Rigg, Ann. Repts.*, 1909–10 *and* 1910–11).—These trial plots have been under experiment for fourteen years. They are manured every third year in order that the effect in each of the three years after manuring may be seen. The manures were last applied in 1909, and in that year plots dressed with nitrate of lime and calcium cyanamide were added. The hay crops in cwts. per acre with farmyard manure, the most successful mixture of artificials, and the two new nitrogenous manures have been as follows:—

	1909. Cwt.	1910. Cwt.	Fourteen years average. Cwt.
No manure	38	36	30
10 tons farmyard manure	41	51	42
¾ cwt. nitrate of soda, 1½ cwt. kainit, 3 cwt. super.	52	47	40
			Two years average.
¾ cw nitrate of lime, 1½ cwt. kainit, 3 cwt. super.	49	42	45
⅔ cwt. calcium cyanamide, 1½ cwt. kainit, 3 cwt. super.	48½	48	48

Manuring of Swedes and Mangolds (*Cumberland and Westmorland Farm School, Newton Rigg, Ann. Repts.*, 1909–10 *and* 1910–11).—The yield of swedes has been compared on plots dressed with farmyard manure alone, farmyard manure with a small quantity of artificials, and various mixtures of artificials alone. In 1910 the crop with no manure was 5 tons per acre, and with 12 tons of farmyard manure 27½ tons per acre. A small addition of artificials increased this to 32 tons, and very similar quantities were obtained with artificials alone.

Nitrate of lime and calcium cyanamide were also tested as top-dressings for mangolds.

Manuring of Potatoes (*Edinburgh and East of Scotland Agric. Coll., Report* 24).—The object was to demonstrate the advantage of supple-

* A summary of all reports on agricultural experiments and investigations recently received will be given each month. The Board are anxious to obtain for inclusion

menting the ordinary dressing of dung with a moderate applica..... of a well-balanced mixture of artificial manure. The commonest practice in the south-eastern counties of Scotland is to grow potatoes after a corn crop, and by way of preparation to apply 15 or 20 tons of high-class farmyard manure, either on the stubble or in the drill in the spring.

Four plots were laid down at six centres, all being manured alike with farmyard manure. The effect of a dressing of 1½ cwt. sulphate of ammonia, 4 cwt. superphosphate, and 1½ cwt. sulphate of potash per acre was tested on one plot, and a dressing of half this quantity on another plot at each centre. The full dressing cost a little over £2 per acre, and produced an average increase of 3 tons 12 cwt. per acre; while the half-dressing increased the crop on the average by 2 tons 5 cwt. per acre, and cost £1 1s. 6d.

Another mixture was also tested with similar results, and there appears little doubt that it pays in most cases to supplement farmyard manure with a complete mixture of artificials.

Liming of Arable Land (*West of Scot. Agric. Coll., Bull.* 55).—The effect of the application of lime in large amounts at long intervals of time has been compared with the effect of small and frequent dressings. The experiment was carried out from 1902 to 1909 on a light, loamy soil poor in lime, but in excellent physical condition. Four plots of $\frac{1}{20}$ acre each in size were treated with 4 tons of lime per acre, applied in one, two, four, and eight dressings of 4 tons, 2 tons, 1 ton, and ½ ton respectively, the first dressing being given in the winter of 1901–2, and the subsequent dressings, if any, in each succeeding winter. In addition, one plot was treated with 5 cwt. lime in each of the eight years, and the effect of the application of 4 tons gas lime in one amount was tested on another plot. The rotation during the eight years was as follows: Turnips, barley, seeds hay, oats, potatoes, wheat, seeds hay, and oats.

The conclusions drawn from this experiment may be summarised as follows:—

Large dressings of not less than 4 tons per acre applied at long intervals of time are much less effective in producing an increased yield of crops than the same quantity of lime applied more frequently in divided doses, and on such soils as that on which these experiments were conducted they are not likely to prove profitable. The largest increases were obtained in this experiment from annual applications of 10 cwt. burnt lime per acre. Applications of 5 and of 10 cwt. per acre per annum gave profitable results, but the larger dressings of 1, 2, and 4 tons per acre proved very unprofitable.

The direct application of lime to the turnip crop produced a large increase in the yield, and the larger the quantity of lime given, up to 4 tons per acre, the greater was the increase. A dressing of 10 cwt. per acre proved, however, most profitable.

On the hay crop lime applied to the previous crops was beneficial, but lime applied on the young seeds tended to diminish the yield of hay, except when given in small quantity. Liming exercised a beneficial effect on all the cereal crops, but on the potato crop the effect of

produced a considerably smaller increase than an equal weight of burnt lime, but in the seven succeeding years of the rotation its action was much more beneficial to the crops.

Relative Economy of Ground and Slaked Lime (*West of Scot. Agric. Coll., Bull.* 55).—An account is given of a method of slaking burnt lime in such a manner as to produce a powder as easily distributable as ground lime and at a less cost. A ton of lime shells was placed in a heap and slaked with 20 gallons of water, the heap being immediately after covered with a few inches of earth. About twelve hours later it was turned over, and water was applied to all lumps that remained unslaked; the lime was then passed through a ½-inch riddle to take out stones and unslakable lumps, and the slaked lime thus riddled was found to remain in the form of a very fine dry powder, which was sown without difficulty by a manure-sowing machine. In order to get the lime into the proper condition for sowing, the heap must be turned over and riddled not less than twelve nor more than twenty-four hours after the first watering; and after the stones have been separated by riddling, the lime must be sown without delay, or it will become sticky and incapable of being sown by machine.

Slaked lime so prepared is stated to be better than ground lime, because the burnt lime in the process of slaking breaks up into a much finer powder than that produced by grinding, and it also swells into a bulk so much greater that much smaller quantities can be sown without difficulty by machine. The total cost per ton is given as 13*s*. 8*d*., compared with 18*s*. per ton of ground lime.

FIELD CROPS.

Varieties of Swedes (*N. of Scotland Agric. Coll., Trans. of Students' Assoc.*, 1910).—In 1910 eight varieties of green-top swedes and the variety (Buffalo) that did best in 1909 were tried by eight members of the Association. The heaviest crops per acre on the average were given by the following varieties: Buffalo Purple, 25 tons 5 cwt.; Kent and Brydon's Darlington, 25 tons 5 cwt; Drummond's, 24 tons 6 cwt.; Sutton's, 23 tons 14 cwt. Darlington was the most consistently good, not varying so much at the different centres as the others.

Eight disease-resisting varieties were tried—four of yellow turnips and four of swedes. The season was, however, specially suited for the healthy growth of turnips, and therefore unfavourable for the trial.

Influence of Italian Rye-grass on Other Grasses and on Clovers (*N. of Scotland Agric. Coll., Trans. of Students' Assoc.*, 1910).—One of the members of the Association experienced great difficulty in getting clover to grow, and as the seed mixture used included a considerable quantity of Italian rye-grass, an experiment was arranged to test the effect on clover of substituting perennial for Italian rye-grass, and also to test the effect of manure. Five different mixtures were sown in the spring of 1909, along with an oat crop on a clay soil. Each mixture contained 6 lb. cocksfoot, 3 lb. timothy, 3 lb. red clover, and 3 lb. white clover, and the rye-grasses in the following quantities:—

It will be seen that perennial rye-grass was substituted for Italian rye-grass. In February, 1910, moss-dung litter at the rate of 15 tons per acre was applied to part of each plot. After cutting, samples of the hay of each plot were taken, the grasses and clovers separated out and weighed, and the percentage of each calculated. From these the weights in cwts. per acre of grasses and clovers were estimated, and are shown in the following table:—

	1 Cwt.	2 Cwt.	3 Cwt.	4 Cwt.	5 Cwt.
With dung:—					
Grasses	37	39	37	37	38
Clovers	23	19	13	10	7
Total	60	58	50	47	45
Without dung:—					
Grasses	18	19	24	21	27
Clovers	26	21	15	12	11
Total	44	40	39	33	38

It will be seen that as the proportion of Italian rye-grass in the mixtures increased, so the proportion of clover in the crop decreased. This was the case both with and without manure, though in every case the effect of the dung was slightly to reduce the clover and to increase the grasses. The Italian rye-grass also appeared to have a similar effect on cocksfoot and timothy as on the clover, the quantity diminishing with the increased use of the Italian seed.

Change of Seed in Oat-growing (*Cumberland and Westmorland Farm School, Newton Rigg, Ann. Rept.*, 1909–10).—Irish-grown seed oats of the Waverley variety was tried in comparison with home-grown seed of the same variety with a view to ascertaining whether, as in the case of potatoes, there is any advantage in a change of seed. The crops from local seed were 141½ stones of grain and 27 cwt. of straw, and from Irish seed 112¼ stones of grain and 22 cwt. of straw. As in other trials with oats, no advantage from a change of seed was shown.

Experiments with Potatoes (*Edinburgh and East of Scotland College of Agric., Report XXIV.*).—Variety trials.—These were carried out on a medium loam, 400 ft. above sea-level. Two new varieties, Eclipse and Edina, were tried in 1910 against Mid-Lothian Early and Sharpe's Express, the two latter having given good results among first early varieties in former experiments carried out by the College. Both the new varieties gave good yields, and Edina was promising as regards quality. Among second earlies, Queen Alexandra (a variety indistinguishable from King Edward) and Aberlady did well. The late varieties included a selection from Dalmeny, namely, Helium, A 1, Beauty, Regent, and Bountiful; most of these did very well. Northern Star was retried after several years, and found to be greatly improved in quality, while the yield was high. Two plots were planted with President, a Dutch variety, which was claimed to be a good cropper and more resistant to disease than the older Up-to-Date types. The first plot planted with seed imported in 1909 and grown that year produced a healthy, vigorous plant yielding over 10½ tons per acre. The second, planted with seed imported in 1908 and grown in 1908 and 1909, failed

Effect of Change of Locality.—Seed of Up-to-Date obtained from Boon, in Berwickshire (elevation of 900 ft.), Leadburn, in Midlothian (800 ft.), and Deskford, in the lower district of Banffshire, gave better results than seed from the low district of East Lothian, the seed from these four sources being planted at seven centres in different districts. The North Country seed (Banff) did best, but the results indicate that nearly the same advantage can be obtained by securing seed from a high-lying district.

LIVE STOCK AND FEEDING STUFFS.

Soy-bean Cake as a Food for Cows (*Cumberland and Westmorland Farm School, Newton Rigg, Ann. Rept.*, 1909–10).—Three cows and three heifers after their first calf were used in this trial, which lasted for twelve weeks. They were all at an early stage of their milking period, and, as the milk naturally declined in quantity in the course of the trial, it was decided to feed soy-bean cake during the first and last three weeks, and decorticated cotton cake, with which it was compared, during the middle six weeks. The daily ration of each cow was: 49 lb. swedes or 42 lb. mangolds, 14 lb. hay, 7 lb. oat straw, 4 lb. crushed oats, and either 4 lb. soy-bean cake or 4 lb. decorticated cotton cake. The results on the milk yield were:—

	Gallons of milk produced.	Percentage of butter fat.
First three weeks (soy-bean cake)	315	3·7
Middle six weeks (decorticated cotton cake) ...	527	3·9
Last three weeks (soy-bean cake)	225	4·1

The total milk yield with soy-bean cake was thus 540 gallons, and with decorticated cotton cake 527 gallons, the average percentage of butter-fat being the same with both kinds. The cows lost weight slightly in the early weeks when giving their largest quantity of milk, but gained towards the end.

Linseed Cake for Milking Cows (*Cumberland and Westmorland Farm School, Newton Rigg, Ann. Rept.* 1910–11).—Linseed cakes containing respectively 12 per cent. and 7 per cent. of oil were fed to six cows. As the milk naturally declined in quantity during the trial, which lasted for eight weeks, the rich cake was fed in the first and last periods of two weeks, and the poorer cake in the middle four weeks. The daily ration of each cow was 35 lb. swedes or mangolds, 14 lb. hay, 7 lb. oat straw, 3 lb. crushed oats, and 5 lb. linseed cake. A total yield of 441 gallons was obtained with the 12 per cent. cake and 438 gallons with the 7 per cent. cake. The carcass weight of the cows appears to have been affected by the quality of the cake, as they gained 9 stones 6 lb. during the first fortnight, and 9 stones 7 lb. during the last fortnight with the 12 per cent. cake, but lost 5 stones 7 lb. in the four weeks with the 7 per cent. cake.

Winter Fattening of Mountain Sheep (*Cumberland and Westmorland Farm School, Newton Rigg, Ann. Repts.*, 1909–10 *and* 1910–11).—In the year 1906 a commencement was made in feeding trials with Herdwick sheep. These trials have been repeated each year since, and have been extended to Cheviots, Scotch Blackface, and Greyface sheep. The object has been to see if winter fattening of mountain sheep on pasture land could be successfully and profitably followed, and to what extent these

sheep would stand the good feeding usually given to the larger and quieter breeds of sheep. The plan adopted at first was to run the sheep on the pastures with a rack of hay, and occasional swede-tops, to the end of December, then to supply daily cut swedes in troughs, and early in February to commence corn and cake feeding at the rate of ½ lb. oats and ½ lb. linseed cake to every 3 hoggs. Under this treatment the sheep were clipped, and sold fat about the end of June. In each year following, the pace has been quickened by commencing the trough-feeding earlier than in the previous year, with the result that in 1910 the sheep had all been sold fat by the end of April, and with no more losses than occurred in the earlier years under slower feeding. The following table gives the average results for the whole period:—

	Cost.	Weeks kept.	Sold for.	Cake and Corn.	Gross Profit.	Return for Grass, Hay, and Swedes. Per Week.
	s. d.		s. d.	s. d.	s. d.	d.
Herdwicks (4 years)	10 8	30	31 2	2 4	18 2	5·7
Blackface (3 ,,)	15 8	22	30 9	1 11	13 2	7·2
Cheviot (3 ,,)	13 3	25½	28 6	2 6	12 9	6·0
Greyface (2 ,,)	14 7	18½	32 8	1 10	16 3	10·5

Cross-breeding for Fat Lambs (*Cumberland and Westmorland Farm School, Newton Rigg, Ann. Rept.*, 1909–10).—The results obtained on an average of seven years' trials in breeding from cross-bred ewes are shown in the following table:—

Cross.	Number of lambs per seven ewes.	Average age when fat for market.	Average live weight.	Average selling price.	Price per lb.
Border Leicester Ram—		Weeks.	lb.	s. d.	d.
Ewe					
Cheviot—Border Leicester ...	14	14	75	32 11	5¼
Blackface—Border Leicester	13	12½	76	33 7	5¾
Blackface—Wensleydale ...	12	14½	82	33 8	5
Oxford Down Ram—					
Ewe					
Cheviot—Border Leicester ...	12	13	78	37 4	5⅞
Blackface—Border Leicester	13	11½	73	36 1	6
Blackface—Wensleydale ...	13	14¼	82	34 6	5
Herdwick—Border Leicester	11	13½	78	35 9	5½
Wensleydale Ram—					
Ewe					
Cheviot—Border Leicester ...	12	15	89	36 0	4⅞
Blackface—Border Leicester	11	15½	89	35 0	4¾
Blackface—Wensleydale ..	11	16	89	34 0	4⅝

As soon as a lamb reached 70 lb. it was sent to the market if fat. It will be seen that the Wensleydale cross lambs were slowest in getting fat, though rapid growers; they are therefore better adapted for feeding for mutton than for lamb. The Cheviot—Border Leicester ewe appears to have been the most prolific. The Oxford Down—Blackface—Border

quently realised most per pound. The Herdwick—Border Leicester ew has only been tried two seasons, but when crossed with the Oxfor Down ram the lambs produced have shown fine quality and hav matured quickly.

Weeds, and Insect and Fungus Pests.

Growth of Tobacco for the Extraction of Nicotine (*Jour. Dept.* *Agric. for Ireland, July*, 1911).—The use of nicotine as an insecticid and sheep-dip is at present restricted by the high price, and it is state in the above Journal that the demand has now reached such dimensior that all available waste tobacco of sufficient strength is used for nicotir production, and the manufacturers are seeking for a more extensiv and reliable source of supply than is afforded by the waste tobacco fro factories and warehouses, which, during periods of scarcity, comman good prices for smoking purposes. An article on the growth of tobac for the purpose in England appeared in this *Journal*, August, 191 p. 378.

The Irish Department of Agriculture in 1910 grew an acre of tobac specially for nicotine extraction, with the following financial results:—

Expenditure.

	£	s.	a.
Seeds, beds, preparation of land and manures	7	15	7
Planting and cultivation	2	14	5
Harvesting	2	0	0
Curing	2	10	0
Stripping, baling, and packing	2	0	5
Marketing	0	10	0
Rent, rates, and taxes...	1	3	0
Total	£18	13	5

Receipts.

	£	s.	d.
1,271 lb. tobacco, sold at 3*d*. per lb.	15	17	9
Loss	£2	15	8

The species *Nicotiana rustica*, which has a specially high nicoti content, and yellow Pryor were grown, but the crop was cured a handled in the ordinary way for smoking tobacco. The results sho that it is not commercially profitable to do this, for the reas *that it thereby costs nearly as much to grow tobacco for nicotine* for smoking purposes, while a higher price can be obtained for smoki tobacco. A preliminary test was made with a view to reducing t cost of production by omitting the usual operations, curing, strippin &c., which follow harvesting, and it is intended this season to ma an experiment in producing tobacco extract directly from fresh leave and then selling the extract instead of the cured leaves to the nicoti manufacturer.

It should be noted also that the season was very unfavourable, t

as sets, 53 produced plants which showed no signs of infection with the blight until about thirteen weeks after planting, when the disease was found as isolated spots on the leaflets indicating an attack by spores from a neighbouring diseased plot. It does not seem possible that the blight could have arisen from internal mycelium, as the parts of the plants other than the leaflets were quite healthy. The new tubers, moreover, were in every case found to be quite healthy.

It is concluded that there is no evidence to support the view that the recurrence of the potato disease, year after year, is due to the migration of dormant *Phytophthora* mycelium in or into apparently healthy plants.

HORTICULTURE, CIDER, AND HOPS.

Processes of Cider-making (*Nat. Fruit and Cider Inst. Rept.*, 1910).—*Washing of Vintage Fruit.*—The cider-making season of 1909–10 was considered a suitable occasion, owing to the unfavourable character of the season and the unsatisfactory condition of the fruit available, for testing the effect of washing the fruit before milling. Almost the whole of the fruit used was washed—first in a large tub, and then in a sloping wooden trough, the bottom of which consisted of laths ⅜ in. apart. The amount of dirt, decaying leaves, &c., removed from the fruit was remarkable, but, on the whole, no very striking results as regards the cider were produced in the case of fruit in reasonably good condition. With two ciders made from fruit in good condition, one-half of which was washed and the other unwashed, a difference in the flavour could only be detected as the season advanced, when the flavour of that from the washed fruit became slightly cleaner. There was an absence of taint in the ciders and less "sickness" than usual, but this may not have been due to the washing. Washing was, however, undoubtedly of service where the fruit was in a bad state, and the practice might profitably be adopted as a preventive of taint by those who have large quantities to deal with, and accordingly are not able to ensure such good general condition as those who handle smaller quantities.

Maceration of the Pomace.—Further experiments have been made to ascertain the reason of the value of allowing the pomace to stand some time after milling before it is pressed, and former results have been confirmed, viz., that there is no material increase in the amount of sugar in the juice. Accordingly, the explanation has been sought in other directions. No striking changes are produced in the amounts of acid and tannin in the juice, and the natural rate of fermentation is also not much directly affected. A consequence, however, of allowing the pomace to stand, or maceration—as it may be called—is that a larger quantity of mucilaginous or pectic substances becomes dissolved in the juice. Some of these substances are later deposited in flocculent, or clot-like forms, and act as a natural clarifying agent, and it is suggested that the advantage of maceration is due to the heavier and more flocculent deposit in the juice from macerated pomace and the more thorough and quicker clearing. If this is so, the value of the process may be less since the introduction of the filter. It was found, however, that ciders made from macerated pomace could be filtered at an earlier stage of fermentation and more thoroughly than others, and this may

where filtration is usually ineffective. This effect was demonstrated with Morgan Sweet apples, one of the most difficult varieties to deal with on account of rapid fermentation.

Sulphuring.—The effect of sulphuring has been elucidated in three directions, its action in checking fermentation, and in weeding out the organisms present, with the suppression of undesirable yeasts, acetic bacteria, and the bacilli of cider sickness. From these investigations it is concluded that sulphuring should not be considered a satisfactory practice for the preparation of sweet cider, since, if fermentation is to be checked sufficiently and not merely temporarily, an objectionably heavy dose is necessary in the case of rapidly fermenting juices, and in the case of juices with slower rates of fermentation there are other and less questionable means of checking fermentation. There are, however, possibilities in other directions in favour of a light sulphuring of the fresh juices. A purer type of fermentation, and therefore a superior product, may be found to result, and considerable assistance in the natural clarification of the ciders may be obtained.

Blossoming and Pollination of Fruit (*Cecil H. Hooper, Jour. Roy. Hort. Soc., Vol.* 36, *Pt. III., May,* 1911).—This paper contains notes made at Wye, Kent, on the date and duration of blossoming of nuts, fruit trees, and small fruit in 1908–10, and on the sterility or fertility of varieties when self-fertilised, and the part played by insects in pollination. Most of the substance was included in the articles on the subjects in this *Journal* for December, 1908, p. 678; April, 1910, p, 32; and April, 1911, p. 24, the dates of flowering in 1910 being added.

OFFICIAL NOTICES AND CIRCULARS.

Report of the Committee on Fiars Prices.

A Departmental Committee was appointed by the Secretary for Scotland and the President of the Board of Agriculture in June, 1910, to inquire into the present system of striking Fiars Prices in Scotland, and to report whether the procedure of Fiars Courts can be amended so as to ensure that the annual value of corn and other produce shall be ascertained on a more uniform basis and with greater accuracy; and, if so, what are the best means of attaining that object.

The Report of this Committee (Cd. 5763; price 1½*d.*) has now been published, and contains the recommendations of the Committee on the subject.

Research Scholarships in Agricultural Science.

These scholarships have been established by the Board of Agriculture and Fisheries in order to train promising students under suitable supervision, with a view to their contributing to the development of agriculture, either by carrying out independent research, or by acting in an advisory capacity to agriculturists. They will be granted only to students who show distinct promise of capacity

Twelve scholarships will be awarded in October next if so many suitable candidates present themselves.

The scholarships will be of the annual value of £150, and will be tenable for three years, provided that satisfactory reports are made at the end of each year as to the conduct and capacity of the holder by the authority under whose supervision the scholar is placed by the Board.

Scholars must be prepared to work under such supervision as the Board may prescribe, and at an institution selected by the Board affording facilities for research in one of the following subjects:—

1. Plant Physiology.
2. Plant Pathology.
3. Genetics.
4. Plant Nutrition and Soil Problems.
5. Animal Nutrition.
6. Animal Pathology.
7. Bacteriology, with special reference to Agriculture.
8. Zoology do. do.
9. Economics do. do.

A scholar will not be permitted to engage in other work, except under such conditions as the Board may direct.

The amount of the scholarship will be paid in quarterly instalments, and the scholarship will commence as soon after the award as arrangements can be made for placing the successful candidate at an institution.

A scholar will be entitled to such vacations as may be accorded him by the authority under whose supervision he is placed, but the aggregate absence in any one year is not to exceed two months.

The scholar will be required, as a general rule, to spend some part of the three years at an approved Continental laboratory or university.

An applicant for a scholarship must be (*a*) a graduate of a university, or (*b*) the holder of a diploma of a university or college of university rank. He must be nominated, on the form provided, by a professor or lecturer of a university or college of university rank. Nominations must be received not later than Septemher 23rd next.

Report of the Committee on Grouse Disease.

The Report (Cd. 5871; price 1½*d.*) of the Departmental Committee appointed by the President of the Board of Agriculture and Fisheries in 1905 to inquire into the nature and cause of grouse disease has been recently issued as a Parliamentary paper.

The work of the Committee was carried on with the aid of a number of scientists, who were asked to assist in the investigation, and of a body of local correspondents in different parts of the country.

In 1905 and 1906 the stock of grouse was remarkably healthy, and an excellent opportunity was given of studying the bird under normal conditions. An outbreak of considerable mortality among grouse in 1907 enabled data to be collected of the disease, especially as regards the lingering or pining form of the disease, which has since been traced to the ravages of the threadworm *Trichostrongylus pergracilis*. In

ing special points were studied: (1) The life-history of the *Trichostrongylus pergracilis*, which the Committee believed to be the immediate cause of "grouse disease"; (2) the life-history of the other internal parasites of grouse; (3) the protozoal parasites infecting the alimentary tract and blood of grouse; (4) the bacteriology of grouse; (5) the various insects found on the moors, both from the point of view of insect-borne disease and from the point of view of food; and (6) the questions affecting the food supply of grouse.

As a result of the investigation a large amount of material of scientific and general interest has been collected, which the Committee have published in two volumes entitled "The Grouse in Health and in Disease." This book is published by Messrs. Smith, Elder and Co.; price £2 2s.

The Committee consider that although their immediate object has been achieved, viz., the elucidation of the causes of "grouse disease," the present inquiry has scarcely crossed the threshold of the investigation into the general pathology of birds, and there is still a large amount of work which might profitably be undertaken.

Outbreaks of Foot-and-Mouth Disease.

The Board of Agriculture and Fisheries withdrew as from Wednesday, August 23rd, all the restrictions which were imposed by them on the movement of animals in connection with the recent outbreak of foot-and-mouth disease at Udimore, near Winchelsea, Sussex.

The existence of foot-and-mouth disease among animals at Grange Farm, West Hallam, Derbyshire, was confirmed on August 25th after an examination of the affected animals by the Chief Veterinary Officer of the Board. The usual precautions were taken to prevent the spread of the disease, and the Board ordered the slaughter of all the animals on the premises. An Order has been issued prohibiting the movements of animals in a large area surrounding the infected farm.

Departmental Committee on Foot-and-Mouth Disease.

In conformity with the wishes which have been expressed by members of Parliament on both sides of the House and by representatives of some of the leading agricultural societies, Lord Carrington determined some time ago to appoint a Departmental Committee to inquire into the circumstances of the recent outbreaks of foot-and-mouth disease, and to consider whether any further measures can be adopted to prevent their recurrence. The Committee will be a Departmental one in order to enable representatives of the leading agricultural societies to be nominated as members. It will be appointed and sit in the autumn, when it is hoped that the country will again be free from infection, and that the exceptional pressure upon the staff of the Board which has been occasioned by reason of the recent outbreaks will have ceased.

Lord Carrington invited Mr. Walter Long to act as Chairman of the Committee, but, owing to the pressure of other important duties, Mr.

Recent Leaflets.

The Board have recently published the following new leaflets:—No. 242, Bacteriosis of the Potato and Tomato; No. 245, Crown-Gall; No. 246, Prevention of Damage to Hides, Skins, and Wool; No. 248, The Sclerotinia (*Botrytis*) Disease of the Gooseberry, or "Die-back"; No. 249, "Couch" or "Twitch"; No. 250, Fruit-Bottling for Small Holders; No. 252, Pruning Fruit Trees; No. 253, Isle of Wight Bee Disease.

New editions of the following leaflets are now being issued, the information in a number of them having been substantially revised:—

No. 30, *The Codling Moth.*—Information as to spraying revised.

No. 45, *The Starling.*—Notes on the food of nestlings added.

No. 66, *Fowl Cholera.*—This leaflet has been re-written.

No. 74, *The Composition and Properties of Concentrated Feeding Stuffs.*—This leaflet, originally known as "The Purchase of Feeding Stuffs," has been rewritten, and now consists of 22 pages dealing with the general composition of foods, the digestibility of foods, the productive value of the digestible matter of foods, the manurial ingredients in foods, and the comparative value of foods. It also contains an account of the chief feeding stuffs.

No. 118, *The Sheep Nostril Fly.*—This leaflet now contains a new illustration.

No. 128, *Advice to Beginners in Bee-keeping.*

No. 141, *The Preparation of Honey for Market.*

No. 146, *The Value of Records of the Milk Yield of Cows.*—This leaflet, formerly "Tests for Farmers' Milk," has been rewritten, and is now an eight-page leaflet dealing with simple records of milk yields, testing milk for butter-fat, farmers' milk tests at collegiate institutions, instructions for taking samples, co-operative societies for milk-testing, and the value of milk records to the dairy farmer, with a list of institutions which undertake milk-testing for farmers.

No. 164, *Potato Leaf-Curl and Black-Stripe of Tomatoes.*

No. 170, *The Uses of Lime.*—The statement as to the composition of basic slag has been amended.

No. 173, *Potato-Growing.*—Originally issued as "Potato-Growing in Yorkshire," this leaflet has been extensively revised, and now comprises eleven pages dealing with the questions of seed-tubers, storing of seed, choice of variety, manuring, planting, harvesting, and storing.

No. 195, *American Gooseberry Mildew.*

No. 202, *The Frit-Fly.*

No. 207, *Strawberry Cultivation.*

No. 225, *The Septoria Disease of Tomatoes.*

No. 244, *The Destruction of Rats.*

Copies of any of these leaflets may be obtained free of charge and

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County Committees for the Encouragement of the Horse-breeding Industry.

Lists of County Committees for the e couragement of the horse-breeding indust were given in this *Journal* for April, Ma June, and July. The following further adc tional committee has since been appointed :-

Surrey.

The Hon. Henry Cubitt, Denbies, Dorking.
Sir Thomas Skewes-Cox, The Manor House, Petersham, Surrey.
A. W. Chapman, 51 Whitehall Court, London, S.W.
J. Hutchinson Driver, Melrose, Horsell, Woking, Surrey.
C. G. Leveson-Gower, Titsey Place, Limpsfield, Surrey.
Edward Murray, The Old Cottage, Mickleham, Dorking.
Secretary, Edward Murray, The Old Cottage, Mickleham, Dorkin

Report on the Proceedings of the Board under the Tithe and other Acts.

The Board have recently issued a Report (Cd. 5,689. Price 4½*d.*) f the year 1910 on the business falling within the scope of the (1) Titl and Copyhold, and (2) Commons and Surv Branches of the Department. This includ the proceedings of the Board under the Tith Copyhold, Inclosure, Commons, Land Drai age, Light Railways, and other Acts.

An extract from the report relating to recreation grounds allott under the Inclosure Acts will be given in next month's *Journal*.

MISCELLANEOUS NOTES.

Demand for Agricultural Machinery Abroad.

Demand for Agricultural Machinery and Fertilisers in Russia.—H.M Consul at Moscow (Mr. Grove), in reporting on the trade of that distri in 1910 (*F. O. Reports, Annual Series*, N 4,690), states that as a result of the satisfa tory conditions of the agricultural industry i 1910 there was a rise in the demand for agr cultural machinery and implements as compared with 1909. Th Zemstvo returns are reported to show that the increased demand o 1910 in the central districts of Russia was 8 per cent. higher for harvest ing machinery, and 10 per cent. higher for other agricultural machinery than in the previous year, and in the Volga district 27 per cent. highe for harvesting machinery, and 32 per cent. for other agricultura machinery. The same tendency is observable in the demand for artificia fertilisers, which were used over an increased area in the central agricul tural districts and elsewhere.

H.M. Consul-General at Odessa also reports an increase in the trad of agricultural machinery in that district in 1910, in spite of failure of the harvest in Western Siberia, where large stocks machinery have remained unsold. As a result of competition, Bri sellers are being compelled to give long credit in the same way German firms. This new style of doing business is much more trou some than the old, as the business of banker has to be added to t of manufacturer; but at the same time it seems to meet the necessi

1904 to £4,200,000 in value in 1909. It is a very hopeful sign that improved methods of agriculture are being so widely introduced and that the Government are giving the peasants such effective help in purchasing agricultural machinery. Small credit associations continue their prosperous activity under the control of a special Government Department. They number at present 11,768, with a capital of about £26,243,386. These credit associations, in conjunction with the peasants' co-operative societies, are assisting in the introduction of agricultural machinery, the purchase of seeds, manure, cattle, and land, and also in the sale of grain.

Notes on Agriculture Abroad.

Live Stock and Agriculture in Egypt.—Steps are being taken with a view to improving Egyptian cattle, but it does not appear that the *working* qualities of Egyptian oxen are likely to be improved by importation. At present the yield of milk from the native cow, however, *is less than half the average of a European* cow, while milk is sold retail in Egypt at more than double the price obtainable in the United Kingdom; there is, therefore, an undoubted opening for dairy farmers who would give their attention to a separate milking breed.

With regard to horses, the importation of British stallions gives promise of success. The Turkish Government has now forbidden the importation of mules, and has restricted the importation of horses from Syria and other Ottoman territories. Consequently the value of horses is rising, and there will probably be an opening in the near future for the importation of considerable numbers of European horses.

As regards progress in agriculture generally, a separate Department of Agriculture, attached to the Ministry of Public Works, has been created by Khedival Decree, and commenced work in January, 1911. Special attention has been paid to manurial experiments and the growing of various vegetable and seed crops, with a view to supplying sound seed at moderate rates. There is a good prospect for seed firms in Egypt, the climate being dry and suitable for the production of excellent seed. The local demand is considerable, and an export trade could soon be established.

The cultivation of fruit and vegetables is developing rapidly, and it is stated that there is an opening for more British enterprise in the direction of planting large areas of land with timber and fruit trees with a view to supplying local demands and developing export trade.

Some progress has also been made in the direction of agricultural education. Three agricultural sections of trade schools have been formed, and it has been decided to create four practical farm schools. The necessity for establishing an agricultural college in Egypt was recognised by the Egyptian Government in 1890, when the School of Agriculture was opened at Giza with 59 selected students. Last year no less than 174 applied for admission, and 196 students are now attending the courses there, instruction being now given partly in the Arabic

have been started in various districts throughout the country (*F.O. Reports, Annual Series*, No. 4726).

Establishment of a Service for the Inspection of Plant Diseases in France.—A Presidential Decree was issued on May 1st, 1911, under powers conferred by an Act of December 16th, 1910, creating a service for the inspection of plant diseases in France. The service will have two sections—entomological and cryptogamic—and will be under the direction of the Ministries of Agriculture and Finance. Inspection will be conducted by travelling inspectors on the application of horticulturists to the Ministry of Agriculture, and certificates as to freedom from diseases will be issued if the result of the inspection is satisfactory. No responsibility, however, will be undertaken by the service for the acceptance by foreign countries of consignments accompanied by such certificates. The expenses of inspection will be repayable by the horticulturists, whether such certificate has been granted or not, partly by a fixed annual charge of £1 for every plantation under inspection, and the deficit remaining will be covered by a charge in proportion to the market value of the produce in respect of which an application for certification has been made. In the absence of information necessary to calculate such charge, the contributions of horticulturists will be fixed by the Ministry of Agriculture. (*Journal Officiel*, May 13th, 1911.)

Proposed Standard for Roumanian Wheat.—The following information is from the report by H.M. Consul at Bucharest (Mr. E. MacDonell) on the trade of that district in 1910:—

Owing to the fact that large quantities of Roumanian wheat are annually shipped to Rotterdam and Antwerp, where they are mixed with Russian, Hungarian, and Bulgarian wheat of inferior quality, and subsequently sold on the British market under the name of Danubian wheat, the local merchants and exporters have decided to hold a conference in London with the object of establishing a standard for Roumanian wheat. It is maintained that if pure Roumanian wheat were sent direct to the British market it would command higher prices owing to its quality, and the intermediate profits of the Rotterdam and Antwerp merchants would be divided between the British and Roumanian principals. It is expected that this conference will take place in London during 1911. (*Board of Trade Journal*, June 8th, 1911.)

Progress of Agriculture in Greece.—Much benefit is expected from improved administration of agricultural affairs in Greece. A Ministry of Agriculture and Commerce was recently established, and agriculture is being benefited also by the work of the Agricultural Society of Greece. To improve the native breed of horses, stallions belonging to this society have been stationed at different centres throughout the country; agricultural experimental stations have been established; a programme has been arranged for having the rudiments of agriculture taught in the village elementary schools; and the spraying of vines, &c., for protection against mildew is being promoted by the sale, at a low price, of high-class British sulphate of copper, the distribution being done through the medium of the monopoly offices throughout the

and Parks Act, which received Royal Assent on May 19th, 1911, certain lands in Canada are scheduled and set apart as Forest Reserves for the growth of timber, the conservation of minerals, the protection of animals, birds, and fish, and the maintenance of conditions favourable to a continuous water supply.

The control or management of the reserves is vested in the Director of Forestry, subject to the direction of the Minister of the Interior.

The Act provides for the appointment of rangers and the expropriation of any land within the reserves not vested in the Crown.

Provision is made to allow of the building of necessary public roads; and the holders of licences to cut timber are protected.

During the construction of railways the Minister may appoint fire rangers to protect the adjacent forest from fire, one-half the cost of such fire ranging to fall on the constructors of the railways. The ranger is given extensive powers to enforce the provisions of the Act.

The Governor in Council may make regulations for the proper utilisation of the reserves, including the cutting of timber, working of mines and natural sources of power, preservation of game, and protection against fire.

The Governor in Council may proclaim areas within the reserves as Dominion Parks, which shall be maintained as public parks and pleasure-grounds. Parts of these parks may be made available for building purposes.

The Schedule shows that 25 forest reserves are established, aggregating 25,200 square miles. Of these, 9 reserves, totalling 2,115 square miles, are in British Columbia, 5 reserves (3,584 square miles) in Manitoba, 7 reserves (937 square miles) in Saskatchewan, and 4 reserves (18,564 square miles) in Alberta.

Importation of English-Grown Sugar Beet into Holland.—A report by H.M. Consul at Rotterdam (*F.O. Reports, Annual Series, No.* 4654) states that, in view of the experiments being made in the United Kingdom with the cultivation of beet for sugar-producing purposes, it is of interest to note that several ship-loads of British-grown beet arrived at that port in 1910, destined for inland tinned milk and sugar factories; the crop of Dutch beet not having been equal to the demand, these factories have had to look to another source of supply.

H.M. Consul adds that the cost of railway freight in the United Kingdom and the sea carriage to the Netherlands so enhance the final value of the beet that its importation into the Netherlands in normal times would not be feasible, and only when the factories are at their wits' end to find the supplies they require will they turn to the United Kingdom to make up the deficiency; whether further shipments will be ordered will also depend on the value of the British beet on the market as a sugar-bearing root.

Agriculture in Argentina in 1910.—H.M. Minister at Buenos Aires, in reporting on the condition of agriculture in Argentina in 1910, states that the year was an unfavourable one both for crops and cattle, owing chiefly to drought. The shortage in the rainfall, which has been severely felt in the southern districts for three years or more, extended more into the south-western camps of the Pampa, where immense damage was done to lands cultivated for a large part in a poor way

The area under cultivation, although said to be only a tentl of what it will be in the future, is so large that the drought h affected the whole of it. The district that has suffered most i of Bahia Blanca, but much of the land in this district has onl forced under cultivation in consequence of the phenomenal achieved by agriculture in recent years. Not much science is u cultivation, and even the most rudimentary principles of farmi neglected by the Russian and Syrian immigrants, who till the in question. The effect of the drought has, however, been sore in many parts of the country where agriculture is not carried such a haphazard fashion.

The grazing interests of the country have also suffered se more especially in parts where farms were overstocked with catt little forethought shown in making ready for less favourable s than have blessed Argentina of late. One of the results of th tinued low rainfall has been the disappearance of surface water, has necessitated the erection of water-wheels on the Australian ciple throughout the country devoted to pasture. Water can ge be found at a reasonable depth, from whence it is pumped by of a wheel turned by the wind and discharged into a reservoi nected by pipes with troughs from which the cattle can drink. up a pump costs about £200, which gives some idea of the e to which cattle-raisers have been put by the disappearance of s water, such as lakes and streams, throughout the country, a menon which must be due to more than the actual shortage rainfall. The increase in the area devoted to the cultivation of and alfalfa is held responsible for this disappearance of surface but the phenomenon is just as apparent in the grass districts, little grain or alfalfa is grown, as in the cultivated parts of the co Moreover, in many places it has already been found necess deepen the wells.

A dispatch of May 1st, 1911, states that the rains of April, ended the drought, came too late to benefit pasture land. The live stock will continue through the winter, and the effects o mortality will be felt for some years to come. The effects drought were apparent in a restriction of credit by the banks.

Future of the Manchurian Bean Trade.—The question of the pr future output of soy beans from Manchuria is of importance in of the demand for these beans in Europe and in North America.

A report of the Imperial Maritime Customs of China (II., S Series, No. 31) in this connection states that it is doubtful w the cultivation will extend much in the districts where the b already grown on a large scale (*i.e.*, Southern Manchuria), as it much to hope that the beans will supplant the other crops, su millet and kaoliang, as far as the conservative Chinese peas concerned.

It is in the northern and western districts of Manchuria th possibility of extension lies, *i.e.*, the districts beyond Petuna, Iulan valley, and towards Mergen. The construction of a railv his vast region is contemplated, and the land is mainly virgi xtremely fertile, which offers excellent inducements to immi vho are now entering Manchuria in greater numbers than for wing to the removal of the Government restrictions.

A promising feature of this extension of the area in a northerly direction is that, at present, the further north the beans are grown the better in quality do they become. The best reports have, in fact, been received of beans grown far above Harbin. It is true that in the districts which lie far north there is always a risk of early frosts descending upon the harvests; but this danger could be averted by cultivating specially selected varieties which mature in the shortest possible period.

Much remains to be effected in the way of improvement of commercial arrangements in connection with the dispatch of the beans at the Manchurian ports.

Effect of Electricity on Sheep Raising.—According to Prof. Silas Wentworth, of Los Gatos, California, his experiments with electric influence on animal and vegetable life at his experimental farm on a ranch near Roseville during the past year have proved that electricity will more than double the production of lambs and greatly increases the yield of wool. A flock of 2,000 sheep was divided, one-half being placed in a field under the power wires of an electric power company, while the other was removed from electric influences.

In the field under the electric power line the production of lambs averaged a fraction over two lambs to each ewe. In the adjoining field where electrical influence was lacking the lamb average was less than one to each ewe. Similar differences were noted in the yield of wool from the sheep in the different fields. The fleeces from the sheep in the electrically-influenced field proved 20 per cent. heavier.

Preparations are being made to plough up both fields and plant wheat, when the effect of the current on the growth of that cereal will be tested. (*F.O. Reports, Annual Series, No.* 4650.)

Agricultural Congresses and Exhibitions Abroad.

Live Stock Shows at the Turin International Exhibition.—An International show of cattle and sheep was to have been held in connection with the Turin Exhibition in June last (see particulars in *Journal* for March last, p. 1032) but had to be postponed, and will now be held in Turin from September 28th to October 2nd 1911. Classes for pigs have now been added to the original schedule. An international show of horses will be held at the same time.

An international dairying industry show will also be held in connection with the main exhibition from October 1st to 15th, 1911. There will be classes for milk, butter, and cheese, and for machines, implements, and accessories used in the dairy. There will also be prizes for articles, publications, illustrations, and photographs dealing with the sanitary handling of milk, &c.; for the best system of collecting and distributing milk in populous districts; for dairying associations and organisations, &c.

Further particulars of any of these shows may be obtained from

THE IDENTIFICATION AND ERADICATION O SOME COMMON WEEDS.

III.*

HAROLD C. LONG, B.SC. (EDIN.),

With Drawings from Nature by BERTHA REID.

CORN PANSY.

The Corn Pansy or Heartsease (*Viola tricolor*, L.), wit various sub-species, is found chiefly on arable and waste lan and is widely distributed. It occurs on calcareous soils, bı more frequently on light sandy land. Brenchley found absent or exceedingly rare on clays and heavy land.† It a pretty and very variable annual. The name Pansy apparently derived from *Paunce*, *Pensée*, and hence the ol saying, "Pansie for thoughts," the pansy being generall accepted as the symbol of remembrance or constancy. Hen the name Herb Constancy for this little plant, which is als termed Wild Pansy and Pansy Violet. Shakespeare make Ophelia say :—"There's pansies, that's for thoughts."

Seeds.—The seeds (Fig. 1, *a*) of *Viola tricolor* are com monly present in samples of Timothy, Alsike, and othe grass and clover seeds, and are a very undesirable impurity Burchard ‡ describes the seed as shaped like a thick comma *with a sharp point. It is about* $\frac{1}{20}$ *to* $\frac{1}{16}$ *in. (1·2 to 1·5 mm* in length, evenly coloured light brown or yellowish-brown t fairly dark brown, smooth and usually somewhat shiny, an the hilum is at one side near the pointed end or projection which is slightly lighter in colour than the rest of the seec The seed is slightly flattened, and many specimens sho clear depressions on the flattened sides; it is more or les conical, but owing to the compression referred to has strong tendency to lie in a particular position, and whe moved rolls over to that position. Fresh seed is plump hard, and slippery.

Seedlings.—In its early stage (Fig. 1, *b*) the seedling ha

* The previous articles appeared in the *Journal* for July, 1911, p. 288, an September, 1911, p. 460.

† "Weeds in Relation to Soils," W. E. Brenchley: *Journal of the Board*

FIG. 1.—CORN PANSY (*Viola tricolor*, L.).

a, Seed, nat. size and ×4½; *b*, early stage of seedling ×1; *b'*, surface view of two typical forms of cotyledons ×1½; *c*, second stage of seedling ×1; *d*, third stage of seedling ×1; *e*, flowering portion ×1; *e'*, surface view of flower ×1.

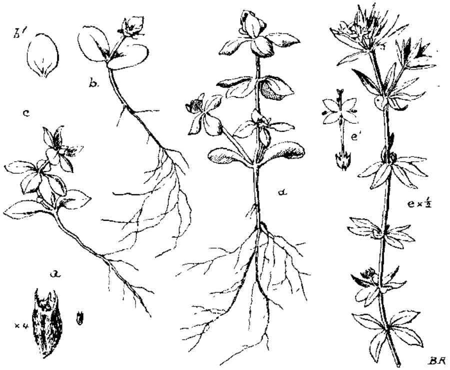

FIG. 2.—FIELD MADDER (*Sherardia arvensis*, L.).

a, Fruit, nat. size and ×4; *b*, early stage of seedling ×1; *b'*, surface view of cotyledon ×1; *c*, second stage of seedling ×1; *d*, third stage of seedling ×1; *e*, flowering portion ×½; *e'*, flower magnified.

a finely fibrous root, and the hypocotyl is long, slender, smooth, and pearly. The cotyledons (Fig. 1, *b′*) are very variable in shape, and may be round-oval, nearly oval, or nearly lanceolate; they are broader towards the base, light green, smooth, and shortly petioled, the petiole being channelled above and tinged brownish. The blade of the cotyledon is $\frac{1}{10}$ to $\frac{1}{4}$ in. long by $\frac{1}{15}$ to $\frac{1}{5}$ in. broad (2·5 to 6 mm. long by 1·7 to 5 mm. broad).

In the second stage seedling (Fig. 1, *c*) the cotyledons have attained their maximum growth, and the petioles are roughly as long as the blades of the cotyledons. The first leaves are radical, petiolate, broadly ovate, with notched margins, and have a well-marked mid-rib, with veins clearly showing at the back. The stalks are long, rather broad, channelled above, convex below, and slightly and minutely hairy.

The third stage seedling (Fig. 1, *d*) shows a central stem, while incipient branches are appearing. The leaves are larger and more clearly notched at the margins; they are light green above, and silvery beneath, with central mid-rib or vein alternately branched. A few minute hairs occur on the leaf stalks and margins.

Mature Plant.—The plants grow quickly, and when they reach the flowering stage (Fig. 1, *e*) are 6 to nearly 18 in. high, and the stem is angular and branched, with a large pinnatifid stipule on each side of the leaves. The flowers (Fig. 1, *e* and *e′*) spring from the axils of the leaves with the stem, and are borne on long stalks; they are $\frac{1}{2}$ to $1\frac{1}{2}$ in. in diameter, and, as the specific name *tricolor* implies, are roughly three-tinted, the colours being very variable—whitish purple, lilac, pale yellow or golden yellow, sometimes particoloured. The flowering-period is from May to September, and the plant is widely distributed in Europe, Northern Africa, Asia, North-West India, and America. The fruit is a three-valved capsule containing many of the hard, slippery seeds. There are large numbers of cultivated varieties of *Viola tricolor,* which are among the most beautiful of our garden flowers. Anne Pratt states that "The flower, when bruised, has a faint scent of peach kernels, an odour which is more powerful in the cultivated kinds, and

which is communicated to water in which the heartsease is distilled." *

Prevention and Remedy.—The Corn Pansy is an annual which produces an abundance of seed, and hence must be combated by surface cultivation, and the free use of the hoe among roots after corn. Care should be taken that pure samples of clover and grass seeds are sown.

FIELD MADDER.

Field Madder (*Sherardia arvensis*, L.) is a small prostrate annual which is often plentiful on cultivated land, especially on light sandy loams and calcareous soils. Brenchley found that in the district between Harpenden and Bedford the weed is frequent on clays and heavy soils, as well as on sandy soils and light loams, while it is "symptomatic" of the chalk. Anne Pratt remarks that "The plant abounds in the ridges of cornfields, and on dry banks, especially where the soil is of gravel." It is, perhaps, most generally found in "seeds," and the fruits are a common impurity in samples of red clover, Italian ryegrass, and "seeds" mixtures. The generic name is after the botanist Sherard.

Fruits.—The seed of Field Madder is enclosed in a fruit (Fig. 2, *a*), which is small and rough, and crowned by three erect, persistent, spiny calyx teeth. The fruits are two-lobed ashy-grey to grey-brown in colour, owing to numerous fine white hairs closely pressed to the fruit. Each lobe is somewhat egg-shaped, rather flattened on one side, and furrowed ngthwise on that side. The total length is about $\frac{1}{12}$ to $\frac{1}{8}$ in. 2 to 3 mm.), and the breadth $\frac{1}{20}$ to $\frac{1}{15}$ in. (1·2 to 1·7 mm.) road. The fruits are a very common impurity in the seeds clovers and grasses throughout Europe.

eedlings.—The first stage seedling (Fig. 2, *b*) shows a leveloped fibrous root-system, the roots being yellowish ur. The hypocotyl is light green and smooth. The ns (Fig. 2, *b*′) are broadly ovate to roundish, fleshy, lark green, with very short broad petiole, and clearly d from the base; they are $\frac{1}{4}$ to $\frac{3}{8}$ in. (6 to 9 mm.) th, and $\frac{1}{6}$ to $\frac{3}{10}$ in. (4 to 7·5 mm.) broad, enlarging

In the second stage seedling (Fig. 2, *c*) the hypocotyl may have become yellowish or even tinged with red. The central stem rises from between the cotyledons, and also a pair of opposite branches—the stem is branched from the base. The stems are rather angular and sparsely hairy. The leaves are cauline, and, with the leaf-like stipules, are usually in whorls of four; they are oblong-lanceolate, somewhat narrow at the base and broad towards the apex, which terminates in a short awn, while they are sparsely hairy, but regularly so round the margins.

The third stage seedling (Fig. 2, *d*) clearly shows the branching character of the plant and the strong root-system, while the leaves and leaf-like stipules are now in whorls of four to six, and the whole plant is rough to the touch.

Mature Plant.—The grown plant is low and spreading in habit—nearly prostrate—much branched, and with stems up to about 18 inches in length. The leaves are narrow, obovate-lanceolate, pointed, under an inch long, and, with the very similar stipules, in whorls of four to six. The flowers are in terminal sessile clusters, are individually about $\frac{1}{8}$ in. in diameter, and lilac in colour; they open between April and October. The fruits have been already described.

Prevention and Remedy.—Care must be taken to prevent the introduction of the seeds with clover and grass seeds. The weed is an annual which must be combated by means of surface cultivation from early spring onwards, by the free use of the hoe, and by hand-pulling where it occurs in "seeds." Clean cultivation and the growth of heavy crops should suffice to keep this weed in abeyance.

CLEAVERS.

Cleavers (*Galium Aparine*, L.) is a well-known weed which has received a large number of trivial names, among them being Clithe, Cliver, Cliders, Goose-grass, Goosebill, Hariff, Grip-grass, Catch-weed, Love-man, Scratch-weed, and Robin-run-over-the-hedge, many of which bear obvious relation to the rough clinging character of the weed. It is a weak, lanky, straggling hook climber, and occurs on most soils on arable land, being particularly troublesome among cereal crops, especially on light loamy soils. It climbs among the corn for

support, and by sheer weight drags it down, rendering harvesting operations difficult. Brenchley found it frequent alike on clays, chalk soils, and sands and light loams, while it was absent or very rare in seed-crops. Holdich wrote * that cleavers is "principally addicted to deep, loose soils, mellow, marshy land, and the drier sorts of fen land. All lightish loams may have hariff, but it abhors clay, and fen soils lying damp and low are not friendly to it, though it be one of the very worst weeds where it abounds. The farmers of clay lands on the verge of the fens often buy their seed wheat of the fen farmers; and they heed not the seeds of hariff for, if they grow, they come to no length, and are never seen at harvest."

Cleavers is frequently chopped up and given as a food to poultry; Hulme says† that "the whole plant gives a decoction equal to tea"; and William Pitt, Harz, and Anne Pratt state that the seeds (fruits) form a substitute for coffee; while Harz adds that when roughly ground they can with advantage be used as a cattle food.‡ Anne Pratt also says of this weed: "Dioscorides tells that it was used in his time as a kind of filter for straining milk, and Linnæus says it is commonly so used in Sweden. In our own country places it is occasionally thus employed, when a sieve is not at hand, and it answers the purpose exceedingly well, by the roughness of its leaves and stalks." Ewart says § that the weed is eaten by stock when hungry, but, though not poisonous, it is apt to cause internal inflammation, and has a certain diuretic action.

Fruits.—As in the case of *Sherardia arvensis* the seed of *Galium Aparine* is enclosed in a rough fruit, which is rather large, roundish, but somewhat compressed from above to the scar beneath, hard, grey-green to purplish in colour when ripe, and very rough, owing to numerous hooks by means of which it clings to the clothes of man or the hair and fur of animals, so ensuring distribution (Fig. 3, *a*). The fruits are

* "An Essay on the Weeds of Agriculture," Benjamin Holdich. Edited by G. Sinclair, 3rd edition, 1825.

† *Familiar Wild Flowers*, F. E. Hulme, Vol. v., p. 103.

‡ *Landwirtschaftliche Samenkunde*, C. D. Harz, 1885.

§ *Weeds, Poison Plants and Naturalised Aliens of Victoria*, A. J. Ewart, 1909.

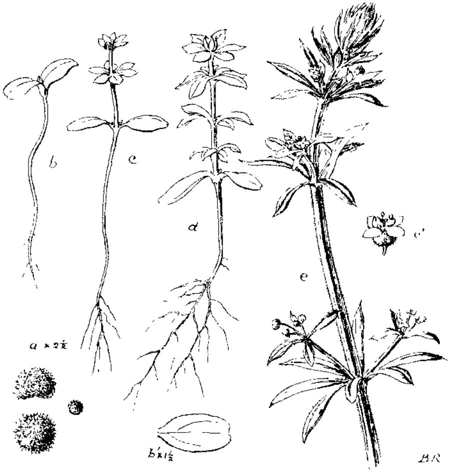

Fig. 3.—Cleavers (*Galium Aparine*, L.).

a, Fruit, nat. size and × 2½; *b*, early stage of seedling × 1; *b'*, surface view of cotyledon × 1½; *c*, second stage of seedling × 1; *d*, third stage of seedling × 1; *e*, flowering and fruiting portion × 1; *e'*, flower magnified.

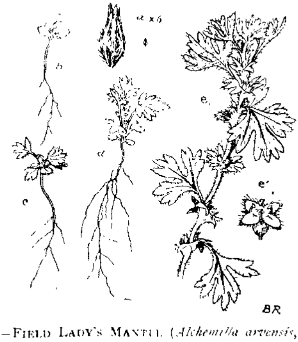

Fig. 4.—Field Lady's Mantle (*Alchemilla arvensis*, Lamk.).

a, Fruit, nat. size and × 6; *b*, early stage seedling × 1; *c*, second stage seedling × 1; *d*, third stage seedling × 1; *e*, flowering portion × 1; *e'*, flower magnified.

Wen

two-lobed, each lobe containing a seed, and the under side of each bears a shallow roundish depression or hollow; they are $\frac{1}{12}$ to $\frac{1}{8}$ in. (2 to over 3 mm.) in diameter, and $\frac{1}{12}$ to $\frac{1}{10}$ in. (2 to 2·5 mm.) thick. Burchard describes the fruit as grey in colour, warty, with short curved whitish spines on the warts; the outer coat may be lost during threshing operations, and the seed is then seen to be smooth and grey-brown. The fruits are much too common in clover and many grass seeds as well as seed corn throughout Europe. Ewart remarks that "although the seeds do not appear to have a very prolonged vitality, they are able to resist the action of fermenting manure for some months without losing the power of germination," while passage through the stomach of an animal usually favours germination.

Seedlings.—Cleavers is a very hardy annual, and the seeds germinate quite late in the year. At the moment of writing (the last week of November) seedlings may be found in thousands in all stages along the hedgerows. In the first stage (Fig. 3, *b*) the seedling is observed to be strong and sturdy, with fibrous roots, and stout smooth hypocotyl, which is whitish below to brownish-green tinged with red above. The cotyledons (Fig. 3, *b'*) are nearly oblong, markedly incurved at the apex, with a short broad petiole about one-third the length of the lamina and scarcely distinct from it; they are smooth, and about $\frac{2}{5}$ to $\frac{1}{2}$ in. (10 to 12 mm.) long by $\frac{1}{4}$ to $\frac{1}{3}$ in. (6 to 8 mm.) broad without the petiole.

The cotyledons enlarge as the seedling grows, and in the second stage (Fig. 3, *c*) may be $\frac{2}{3}$ in. (16 mm.) long by $\frac{3}{8}$ in. (9 mm.) broad. There are signs of branching from the base; the stem is four-angled and bears stout hooked hairs turned downwards, enabling the weed to climb. The leaves and leaf-like stipules are rather variable, but are four to six in a whorl, and broadly lanceolate to lanceolate or nearly round-oval, narrowing towards the base, while they are densely hairy and rough, and bear a short spine at the apex.

The still older seedling (Fig. 3, *d*) is much like the stage already described, but the cotyledons may now be up to $\frac{7}{8}$ in. (21 mm.) long by $\frac{3}{5}$ in. (15 mm.) broad, the petiole being $\frac{1}{3}$ in. (8 mm.) long. This stage is strikingly like the mature

plant, and the seedling can hardly be mistaken after the stage shown in Fig. 3, *b* is passed.

Mature Plant.—Cleavers grows rapidly from the seed, which germinates in late autumn, early winter, or early spring, the flowering stage being reached by or before June and continuing through the summer. The mature plant (Fig. 3, *e*) is long and straggling, and much branched. The four-angled stems are provided with inverted hooks to enable the plant to climb; the leaves and stipules are narrow and lanceolate, ½ to 2 ins. long, with a spine at the apex, and in whorls of six to eight; the small flowers (Fig. 3, *e'*) are white, and occur in small clusters springing from the leaf axils. The fruits are described above.

Prevention and Remedy.—Pure seeds must be sown, particularly red clover, Italian rye-grass, and seed corn. The fruits may occur plentifully in farmyard manure, and care should be taken to destroy the germinating power of all weed seeds before giving them to stock. Percival states * that "In some of the worst cases we have seen the weed was brought to the farm by dung containing the seeds." Surface cultivation during early spring and summer, and again in late autumn, encourages the seeds to germinate, when the seedlings may be destroyed by the harrows or in autumn by ploughing under. The hoe should be kept busy throughout the summer, and in bad cases removal by hand may be useful, though this method is of necessity difficult. Holdich says, "How to destroy this weed is how to destroy all annuals, namely, by encouraging the seeds to vegetate and killing them with the plough."

LADY'S MANTLE.

Field Lady's Mantle (*Alchemilla arvensis*, Lamk.), also known as Parsley Piert or Parsley Break-stone, is a little annual which may sometimes prove too plentiful in cornfields, particularly perhaps on dry, loamy, and calcareous soils. Pitt † terms it "a diminutive weed of small account, but sometimes too much abounding."

* *Agricultural Botany*, J. Percival, 1910, p. 594.

† "On the Subject of Weeding; or the Improvements to be effected in Agriculture by the Extirpation of Weeds," William Pitt: *Communications to the Board of Agriculture*, Vol. v., 1806.

Fruits.—The fruits (Fig. 4, *a*) occur one to three together, the seeds being enclosed in the calyx-tube. They are about $\frac{1}{12}$ in. long by $\frac{1}{15}$ in. broad (2 mm. long by 1·7 mm. broad), light brown in colour, rough and hairy, somewhat streaked owing to shrinkage of the calyx, and compressed, so lying on one of the two broad sides; they terminate in eight teeth, four large and four small, the remnants of the calyx and epicalyx—the eight teeth, however, are seldom clearly visible.

Seedlings.—When the seedling first appears it is very minute; the first stage shown (Fig. 4, *b*) has a brownish fibrous root, and a slender, smooth, colourless hypocotyl tinged with red. The cotyledons are very small, at first forming a kind of sheath at the base, inclined to the same side, petiolate, roundish and slightly incurved at the apex, green above and whitish below. The petiole is flat and broad, and about $\frac{1}{12}$ in. (2 mm.) long, while the blade is $\frac{1}{15}$ to $\frac{1}{12}$ in. (1·7 to 2 mm.) in diameter.

The second stage (Fig. 4, *c*) shows that the first leaves are radical, trifid and lobed, hairy above and at the margins, green above and whitish beneath, and petiolate, the petiole being channelled above and with a broad wing on the lower part. In this stage the under-surface of the cotyledons and the stalks of the leaves may be slightly tinged with pink.

Subsequent stages (Fig. 4, *d*) closely resemble the second stage, the leaves being trifid and lobed, dark green and hairy above, whitish beneath, and with a dark vein running to the apex of each lobe or tooth.

Mature Plant.—The flowering plant (Fig. 4, *e*) is about 4 to 9 ins. in height, prostrate, hairy, with small fan-like trifid leaves which clasp the stem like an inverted mantle. The minute flowers (Fig. 4, *e'*) bear no petals, and are green; they are in crowded clusters in the axils of the leaves, and appear between May and August.

Prevention and Remedy.—Field Lady's Mantle is not usually very troublesome, but where it occurs in quantity must be thoroughly hoed out, while surface cultivation in spring will aid in reducing it. The root crop following a cereal will keep it down, and it is unlikely to be plentiful in a good "take" of "seeds."

Peat-Moss Litter Manure.

The supply of farmyard manure for use in the Royal Botanic Gardens, Kew, is obtained in the neighbourhood from contractors, 'bus proprietors, and others who keep a number of horses. For some years a considerable proportion of the manure thus obtained has been made with peat-moss litter, imported, it is believed, from Denmark, and composed chiefly of compressed dead moss and bog peat, as it has been formed in marshes, &c. It is neither peat nor moss as these are understood in horticulture, and is entirely unsuited for the growth of plants. It is imported in the form of bales which are broken up in the stables to be spread as bedding in the stalls. When it becomes saturated with urine and contains a considerable proportion of horse droppings, it is thrown into a heap to be carted away. Compared with straw-made manure this moss-litter manure is cheap, but it is not looked upon with favour by market gardeners. Its use at Kew has been mainly as a top dressing for lawns and borders, but only after it has been exposed to the air for about six months, and turned several times. It has not been used for mixing with the soil, but this spring some of the flower-beds were in error manured with it. Its effect on the health and growth of the plants which were afterwards put into these beds for the summer was markedly deleterious. The plants not only failed to start into growth, but many of them weakened and died, and as this was evidently due to the manure in the soil in which the plants were set, samples of the soil and manure were submitted to Dr. J. A. Voelcker for analysis and report.

Dr. Voelcker's report was as follows:—

"I have now completed my examination of the sample of Soil and that of Peat-Moss Manure which you sent me.

"The analysis of the Peat-Moss Manure is as follows:—

Moisture	39·59
Organic matter and salts of ammonia ...	46·87
Oxide of iron and alumina, with traces of phosphoric acid	1·49
Lime	0·90
Alkalies, magnesia, &c.	4·81
Insoluble siliceous matter	6·34

"The organic matter and salts of ammonia contained 2·11 per cent. nitrogen, equal to 2·56 of ammonia. It was further found that of matters soluble in water the manure contained nitric acid, 0·01; sulphuric acid, 0·33; and chlorine, 0·09 per cent.

"The manure was distinctly acid in reaction, and showed:—

Acidity reckoned as acetic acid ... 0·88 per cent.

"Of the soil a water extract was made, and this gave:—

Total matters soluble in water ... 0·098 per cent.

"Of this 0·046 per cent. consisted of organic matter, and 0·052 per cent. of mineral matter, this latter being mostly sulphate of lime. There was only a trace of chlorine in it, but a marked quantity of nitrates was present.

"In the examination of the manure and soil alike there was not detected anything leading to the belief that disinfectants, deodorisers, &c., had been used with the manure.

"To come next to anything that may possibly have caused the losses experienced with the plants in consequence of using the manure in question—it does not appear, from my examination, that any mineral acid or the like has been used with the manure, nor do I think that any disinfectant, such as carbolic acid, has been employed with the manure. Yet the evidence you have kindly collected and put at my disposal does undoubtedly tend to show that ill results have followed the use of this particular manure. I have, therefore, carefully considered the matter from the light of practical experience and supplemented this with such facts as the analyses have brought out.

"Undoubtedly there is a strong prejudice among gardeners, and market gardeners in particular, against the use of farmyard manure made with peat-moss litter. To what that prejudice is due I have not been able exactly to find out. But there remains the fact that market gardeners will not use this manure until it has been kept stored for a considerable time—say quite two years. After that time it is reckoned safe to use. You inform me that the manure in question was not absolutely fresh, but had been kept some time, though, it would appear, nothing like the two years mentioned.

"I have come to the conclusion—from my examination—that the ill effects in the present case are due to the marked

acidity of the manure, this acidity being due to organic acids in the manure and not to mineral ones. I find in the soil (in which the manure has been used) iron compounds present in the ferrous—or not fully oxidised—condition, and it would seem to me likely that these are the result of the liberal use of an organically-acid body such as the peat-moss, and that an unhealthy, imperfectly oxidised condition of the soil has been brought about.

"Very probably if the manure be kept longer and allowed to rot more thoroughly, it becomes more aerated and oxidised, and then would not show the ill effects noticed.

"This, it seems to me, is a possible explanation of what has occurred in the present case, and it is the explanation, at least, which would suggest itself to me."

For the purpose of comparison the following analysis of farmyard manure is taken from the article on Manures in the new edition of the *Encyclopædia Britannica*, written by Dr. Voelcker. "Farmyard manure consists of the solid and liquid excreta of animals mixed with the material used as litter. Its composition varies according to the conditions under which it is produced. The principal determining factors are: (1) the nature and age of the animals producing it; (2) the food that is given them; (3) the kind and quantity of litter used; (4) whether it be made in feeding boxes, covered yards, or open yards; (5) the length of time and the way in which it has been stored.

"This analysis represents the general composition of well-made farmyard manure in which the litter used is straw:—

Water	75·42
*Organic matter	16·52
Oxide of iron and alumina	0·36
Lime	2·28
Magnesia	0·14
Potash	0·48
Soda	0·08
†Phosphoric acid	0·44
Sulphuric acid	0·12
Chlorine	0·02
Carbonic acid, &c.	1·38
Silica	2·76
	100·00."

* Containing nitrogen = 0·59 per cent. which is equal to ammonia 0·72 per cent.

† Equal to phosphate of lime [illegible].

Cultivation of Furze for Fodder and for Seed in France.

Furze or gorse (*Ulex europæus*) is cultivated for fodder in many districts in France, and is often used to replace clover and lucerne in seasons when green fodder is not available. It is readily eaten by horses and dairy cattle, and cows are said to do as well on it as on good meadow hay.

Before being fed to stock, the stiff spiny branches must be crushed or softened. A hand machine is used for this purpose in France, by means of which the stems are crushed between two cylinders, and then cut by knives into pieces of about two inches in length. The stems are also crushed by hand with a mallet, in a wooden or stone trough, when no machine is available. The necessity for treatment in this way constitutes the most serious objection to the use of furze as a feeding-stuff.

Two varieties of furze are grown in France, the ordinary thorny furze (Ajonc de Dinan) and an improved or thornless variety, known as foxtail furze (Ajonc queue de renard).

Districts where cultivated.—Furze is cultivated principally in the Department of Côtes du Nord, where the plant is much valued, and where an area of 15,000 acres is under this crop. In Morbihan there is an area of about 1,250 acres under regular cultivation, and an equal area on hedges and ditches. The plant is also grown in the Departments of Dordogne, Mayenne, Loir-et-Cher, Finistere, Loire Inférieure, and Ille-et-Vilaine. In Mayenne it is only found at the summits of a few hills, and mixed with heather. It is used with this latter plant as litter, and does not seem to be cultivated either for fodder or seed. In Loir-et-Cher furze is only used to form hedges, and in Loire Inférieure it grows spontaneously on several soils without being the object of any special care. In Ille-et-Vilaine there are a few agriculturists with regular plantations.

On hedges and in ditches the unimproved or thorny furze is, as a rule, the only variety grown, while where regular fields (*ajonières*) are kept under cultivation, the variety is frequently the improved or foxtail variety. The improved variety, without prickles, is much easier to harvest, but where the cultivators possess suitable implements for breaking the furze, this variety is not in great demand.

Seeding is carried out in the spring, at the rate of about 18 lb. per acre. The plant is cultivated in rows of about a yard in width, running from north to south, in order that the plants may derive the greatest possible benefit from light and air. The plant grows vigorously without any attention, and may last on the same plantation for ten years.

The first cutting for fodder is carried out in the second winter after sowing, in November, December, January, and February. From March onwards the furze is bitter, and is not readily eaten by stock. Where cultivation is carried on for seed, it is stated that growers alternate the production for fodder and for seed, as production of seed is considered exhausting for a furze plantation.

The sale of the seed is of importance in some districts, and the following information, obtained by the French Ministry of Agriculture, and forwarded to the Board through the Foreign Office, will be of interest in connection with this subject.

In no case is the cultivation of furze for seed carried on as the sole means of livelihood, as the seed can only be harvested biennially; at least eighteen months after cutting or five months after flowering must elapse before harvesting of the seeds can take place. If a crop is cut during the winter as forage it will not flower until the end of the following winter, the flowering period being from January to April. In the western districts of the Department of Côtes-du-Nord complete maturity of the seed occurs at the end of June and during the first fortnight of July. In Morbihan the seed is harvested on plants of two years.

Harvesting.—Although not complicated, harvesting operations require to be attended with several precautions. The fruit is a dehiscent pod, which opens violently at complete maturity (above all if the weather is dry), and the seeds are scattered in all directions; thus, if harvesting is left too late there is a loss of seed, and only those pods which are not so mature can be gathered. The plantation must be carefully watched, and cutting undertaken when the pods have a brown tint, this being a sign of approaching maturity. In Morbihan the majority of cultivators wait until the first pods are ripe,

Furze seed on hedges and uncultivated lands is gathered by hand by poor country people in many districts, and handed over by them to small rural merchants, who resell to merchants in the large towns. Even where the furze is regularly cultivated, some cultivators prefer to harvest by hand, but the method is slow, and is only possible when an abundant supply of cheap labour is available, and when the price of seed is high.

The stems of furze are cut as near as possible to the pods. When cut by hand, the thorny stems of the plant are raised by a small wooden fork, with two or three prongs, held in the left hand, and the part bearing the pod is cut by a sickle held in the right hand. The lower parts of the stems are taken away later as fuel.

To avoid the dehiscence of the ripest pods, cutting is recommended when the plants are slightly wet, *i.e.*, in the morning or evening, or after a little rain.

Preparation for market.—The pods are carried to the farm and placed on cloths and sacks, or on the barn floor, where they burst open under the action of drying, the seeds being thrown out of the pods and easily gathered. At least a month is necessary for exposure to air and light before the greater part of the seeds can be gathered. If the pods are exposed during drying to too hot sunshine, the quality of the seed will be injured through too early maturity.

The seeds are cleaned by being passed through a winnowing machine. This machine separates the heavy seeds from the light seeds coming from adventitious plants and from impurities, such as husk. Cleaning is also carried out by means of a sieve, with conveniently-sized holes. No other preparation is made before marketing. Purchases are made by rural seed merchants who are directly in touch with the cultivators. Furze seed, if kept in suitable storage, retains its germinative faculty for five or six years.

Yield.—The unimproved variety of furze, growing on hedges and in ditches, is much more productive of seed than the foxtail variety, but seed from the latter is larger in size if care has been taken to thin out the plants.

An acre of ordinary furze yields, on an average, 180 lb. to 270 lb. of seeds, while foxtail gives about 90 lb. to 13[illegible] seeds per acre. A bushel of seed weighs about 56 lb.

Prices.—The prices of furze seed have sensibly risen for several years past. In Côtes-du-Nord the prices for foxtail during the last two or three years have been as follows: maximum price, 1s. 6d. to 1s. 8d. per lb., minimum price, 1s. 2d. per lb.; and the price for ordinary seed has been about 9d. to 11½d. per lb. Higher prices than these, however, seem to have been realised during 1911 in some Departments. In Morbihan 1s. 6d. per lb. is stated to have been obtained for common seed, and 3s. 4d. per lb. for foxtail. As much as 3s. 8d. per lb. is said to have been paid in Dordogne.

Ergot.

This well-known parasitic fungus (*Claviceps purpurea*, Tul.) is of economic interest from two distinct standpoints, viz., its baneful influence on plant and animal life respectively. The great mortality that at one time existed amongst the inhabitants of certain parts of France and other countries where rye, contaminated with ergot, constituted the staple food, is now, fortunately, to a great extent a thing of the past, owing to the fact that the subject has been thoroughly investigated. This has led to the almost total eradication of ergot from our cereal crops. On the other hand, ergot is exceedingly abundant on many wild grasses in this country, and undoubtedly proves highly injurious to cattle. This idea has long been entertained by farmers in this country, but the subject has been most exhaustively investigated in the United States. A serious epidemic of cattle, at first considered to be "foot-and-mouth disease," was proved to be caused by ergotised food. Abortion also frequently occurs when cattle graze in pastures where ergot is abundant.

The first stage of the fungus appears in the form of blackish, horn-like bodies projecting from the inflorescence of cereals and various grasses. The myriads of minute reproductive bodies produced on these black sclerotia are conveyed by insects to the flowers of other grasses, which in turn become infected. During the autumn these black bodies, or sclerotia, fall to the ground, and remain in an unchanged condition until the following spring, when they produce a and ev[illegible]nd form of fruit, the spores of which are scattered by maturity. &c., and infect the flowers of grasses, thus setting up

the stage which results in the production of the black bodies or sclerotia.

Eradication of this pest turns entirely on preventive methods. Keeping grass cut to prevent flowering for two seasons practically eradicates the fungus. Special attention should be paid to wild grasses growing in ditches, hedges, headlands, &c. A goat kept with stock is of service, and has alone in some instances prevented injury to stock, as goats eat ergot without anything but satisfactory results.

Protection of Animals Act, 1911.

The Board of Agriculture and Fisheries are desirous of drawing the attention of agriculturists to certain provisions of the Protection of Animals Act, 1911 (1 and 2 Geo. 5, ch. 27), which consolidates the existing law with considerable amendments. The Act applies to England and Wales, and, with certain modifications, to Ireland, but does not apply to Scotland. It takes effect from January 1st, 1912.

Among the offences of cruelty constituted by the Act, which involve severe penalties on conviction are (1) causing unnecessary suffering to an animal by wantonly or unreasonably doing or omitting to do any act; (2) conveying or carrying an animal in such manner or position as to cause it unnecessary suffering; (3) wilfully and without reasonable cause or excuse administering to an animal any poisonous or injurious drug or substance; and (4) operating on an animal without due care and humanity.

Penalties may also be inflicted on persons who cause or procure any such acts or omissions, and on the owners of animals if they fail to exercise reasonable care and supervision in respect of the protection of the animals therefrom.

The section which deals with these matters does not apply to:—

(*a*) The commission or omission of any act in the course of the destruction, or the preparation for destruction, of any animal as food for mankind, unless such destruction or such preparation was accompanied by the infliction of unnecessary suffering; or

(*b*) The coursing or hunting of any captive animal, unless

such animal is liberated in an injured, mutilated, or exhausted condition; but a captive animal is not considered to be coursed or hunted before it is liberated for the purpose of being coursed or hunted, or after it has been recaptured, or if it is under control.

The section applies not only to domestic animals, but also to any animal which is in captivity or confinement, or which is maimed, pinioned, or subjected to any appliance or contrivance for the purpose of hindering or preventing its escape from captivity or confinement.

In any case of a conviction of an owner for an offence of cruelty to his animal, the court is given the power to direct that the animal shall be destroyed at the expense of the owner if upon the evidence of a duly registered veterinary surgeon it is shown to be cruel to keep the animal alive. If it is shown that the animal would be likely to be exposed to further cruelty if left with its owner, he may be deprived by the court of the ownership of the animal. The owner of an animal may obtain compensation not exceeding ten pounds for the damage or injury caused to his animal by a person convicted of the cruelty which has caused the damage.

Animals in Pounds.—Impounded animals must be fed and watered by the person impounding them under the penalty of a fine; and if impounded animals are left without sufficient suitable food or water for six hours or longer, anybody may enter the pound and feed and water them. In either case the cost of the food or water is recoverable from the owner.

Use of Poisons.—The existing law as to the use of poisons is modified, and under the new Act a person is liable to a penalty if he (*a*) sells, or offers or exposes for sale, or gives away, or causes or procures any person to sell or offer or expose for sale or give away, or knowingly is a party to the sale or offering or exposing for sale or giving away of any grain or seed which has been rendered poisonous except for *bonâ-fide* use in agriculture; or (*b*) knowingly puts or places, or causes or procures any person to put or place, or knowingly is a party to the putting or placing, in or upon any land or building any poison, or any fluid or edible matter (not being sown seed or grain) which has been rendered

In any proceedings under paragraph (*b*) it is a defence that the poison was placed by the accused for the purpose of destroying rats, mice, or other small vermin, and that he took all reasonable precautions to prevent access thereto of dogs, cats, fowls, or other domestic animals.

This provision is, in its application to Ireland, modified by Section 17 (2) of the Act.

Spring Traps.—Any person who sets, or causes or procures to be set, any spring trap for the purpose of catching any hare or rabbit, or which is so placed as to be likely to catch any hare or rabbit is liable to a penalty if he does not inspect, or cause some competent person to inspect, the trap at reasonable intervals of time, and at least once every day between sunrise and sunset.

Societies for Marketing Fruit in Ontario.*

Associations of fruit-growers in Ontario are mainly of three kinds, viz.: Societies for sending apples to markets (generally distant markets), societies for marketing fruit generally and small fruit associations engaged mainly in forwarding small fruit to home markets.

Societies for Marketing Apples.—Of the three kinds of societies these are the least well organised, but the system adopted by one or two of these associations may be of interest. In the case of one society there is no share capital, and the deposits of buyers are depended on for working capital. A shed is rented for storing the apples; buyers are required to pay a certain proportion of the price before the apples are forwarded, and the remainder of the price within a certain time. The society then pays to each member a certain price per barrel of apples, reserving a little more than sufficient to pay expenses. At the annual meeting of the society the amount in hand is paid back to the growers according to the business done by them. The only person who is paid—beside the necessary employees—is the secretary-manager, who receives a commission on the fruit sold.

In another case the members have formed themselves into

* U.S. Daily Consular and Trade Reports, October 10th, 1911.

a joint stock company, owning a central packing-house at which the fruit of all members is packed, a charge being made for each barrel of apples packed. The revenue so obtained forms a fund out of which expenses and a dividend on the stock are paid. In this case sales are made largely by consignment.

General Fruit Associations.—One of the oldest of these general fruit associations is remarkable for the simplicity of its organisation, in that it has no constitution or by-laws, no warehouse, and no capital in any form, there being only a verbal agreement between the members. Each grower packs his own fruit, and sends it to market under his own name, and on its individual merits. Consignments are, however, arranged by a manager, who directs growers when to deliver fruit, pays over to each grower the price realised by his consignment, and attends to various small matters.

A large society which was organised in 1896 has a mechanical cold-storage plant valued at £2,600, and a working capital of £400. A part of the capital was secured by mortgage on the property, no dividends being paid until the mortgage was cleared off. The sales of the society amount to £15,000 worth of fruit annually, business being done for non-members as well as members. This association, in addition to marketing fruit, supplies its members with seeds, fertilisers, spraying apparatus, and materials, &c.

Small Fruit Associations.—These societies forward small fruit to local markets. In one case which is typical the society is incorporated without share capital; it buys fruit from the members, helps to secure a good market, and disseminates information among the members.

Federation of Fruit Associations.—In 1906, thirteen societies became affiliated under the name of the Co-operative Fruit Growers of Ontario, with the object of improving the quality of fruit, keeping the associations in touch with the prices offered at various markets, and securing a more uniform distribution of the crops. Reports are obtained of the conditions in the various fruit-producing districts of Canada, and during the season notes on the condition of the markets, the quality of the fruit being consigned, the prices, and other matters of interest, are sent to each society in a weekly report.

A meeting of the federation is held in the autumn of each year to fix a range of prices as a basis of sales. The federation also purchases supplies of spraying materials, machinery, &c., for the individual societies, very large savings in the price paid being made in this direction.

Grading and Packing.—Where grading and packing are done by individual members, the only satisfactory method of sale is for each member's fruit to be disposed of on its individual merits. In some cases a system of inspection of the grading and packing is undertaken by the society, but this method lacks uniformity.

Two methods of packing and grading by the society itself are adopted. In one case uniformity is ensured by the fruit being packed and graded in the society's warehouse by its own packers. In the other case, the fruit is packed and graded in the orchard by the society's packers. The latter method relieves the grower of much work at a busy time of the year.

Determination of Prices to be Paid to Growers.—The method originally adopted was to distribute returns to members on the basis of the amount of fruit sent to market without consideration as to varieties, but this was found to encourage the production of poor varieties, and a method which has been largely adopted is to divide the varieties of fruit of a certain kind into classes, those varieties of nearly equal quality being placed in the same class. The price is then pooled on each grade of each class. In a third method separate account is kept of each grade and each variety, and the price is pooled on each variety and grade. Pooling is necessary, as one consignment may not sell so well as another.

Production of Sulphate of Ammonia.

The report of the Chief Inspector of Alkali Works for 1910 (*H.C.* 187, 1911), shows that there were 543 works or separate processes for the manufacture of sulphate or muriate of ammonia in England and Wales, as compared with 536 in 1909 and 526 in 1908, the number having steadily increased from 449 in 1904. In Scotland the number of such works was 104. There were also [illegible] gas liquor works in England and five in Scotland.

Sulphate of ammonia is chiefly obtained as a bye-product from coal. When this is treated for the production of coal-gas or for the manufacture of coke used in iron smelting, an "ammoniacal liquor" results, which forms the raw material for the manufacture of ammonium salts. The distillation of the bituminous shales used in the Scotch paraffin industry also yields a certain amount, and the ammonia produced in other manufactures in which coal and similar substances are used, in iron works, from producer gas plants, and from carbonising works, is also collected. The quantity of sulphate of ammonia produced in the United Kingdom is shown in the following table:—

Source.	1910.	1909.	1908.
	tons.	*tons.*	*tons.*
Gas works	167,820	164,276	165,218
Iron works	20,139	20,228	18,131
Shale works	59,113	57,048	53,628
Coke-oven works	92,665	82,886	64,227
Producer-gas and carbonising works (bone and coal)	27,850	24,705	24,024
Total	367,587	349,143	325,228

These figures show an increase over the production of 1909, with the exception of iron works, which remained practically stationary. The supply from coke ovens shows an increase of nearly 10,000 tons. In 1904 the production in coke-oven works was only 20,000 tons. The total production in 1910 was 368,000 tons, and 284,000 tons were exported, so that the balance remaining for home consumption for all purposes amounted to 84,000 tons, as compared with 85,000 tons in 1909 and 91,000 tons in 1908. The exports of sulphate of ammonia are principally to the United States, Japan, Spain, Java, and Italy.

An expansion of ammonia production is anticipated, owing to the further erection of recovery plants connected with the manufacture of coke and fuel gas. Recent improvements in design of sulphate of ammonia plant suitable even for small gasworks is likely to add to the total of sulphate of ammonia production by enabling many small or inconveniently

situated works to produce sulphate more economically than heretofore, whilst the recovery of this substance from peat continues to receive energetic attention, and may prove a further source of production.

In the table below are shown the imports of the materials used in the fertiliser trade, the principal being mineral phosphates. A proportion of the nitrate of soda imported is used in the manufacture of sulphuric and nitric acid.

	1910.	1909.	1908.
	tons.	tons.	tons.
Guano	20,395	20,321	34,417
Mineral phosphates	455,593	451,807	529,135
Nitrate of soda	126,498	90,207	145,724

The figures show a considerable increase compared with 1909 in the quantity of nitrate of soda, Peruvian guano and mineral phosphates remaining the same.

The number of chemical manure works under inspection in 1910 was 161, as compared with 167 in 1907. In Scotland the chemical manure works numbered 38, or the same number as in 1909.

Committee on the British Export Trade in Live Stock.

The Report * of the Departmental Committee appointed by the President of the Board of Agriculture and Fisheries to inquire and report as to the British export trade in live stock with the Colonies and other countries, has been recently issued. The Report deals with the character and extent of the existing trade; and with the possibility of extending it by advertising, by affording facilities to the foreign buyer in this country, and by the establishment of a Government testing station. It also discusses the various hindrances which affect the trade, such as tuberculosis and other diseases, foreign import regulations, transit rates and facilities, export certificates and

The following are the recommendations made by the Committee :—

(1) The export of inferior or unsuitable pedigree stock should be discouraged.

(2) In the appointment of consuls to certain districts a knowledge of British live stock should be taken into consideration.

(3) The Intelligence Division of the Board of Agriculture and Fisheries should be enlarged so as to provide a "Bureau of Information" for increasing the facilities as regards the export of pedigree stock.

(4) The official volume entitled, "British Breeds of Live Stock" should be supplied to British consuls and presented to representative agricultural bodies in certain countries.

(5) Official encouragement and assistance should be given to the system of keeping milk records.

(6) It is desirable that, in the case of countries where exporters of British livestock find difficulties to exist in connection with the tuberculin and other tests, the Government of each country concerned should in the first place be invited to appoint an official in this country for the purpose of testing animals before exportation, as the American and Australian Governments have already done. In the event of any Government declining to adopt this proposal, steps should be taken to ascertain whether the authorities concerned would recognise a certificate issued at a Government testing station in this country, and the Committee recommends that an official testing station (or stations) should be established accordingly, if the exportation of live stock now or in the future would seem to justify the capital and annual expenditure necessary.

(7) There should be no relaxation of the existing live stock import regulations which tend to prevent the introduction of contagious animal diseases into this country.

(8) Official assistance should be given for research work as regards the prevention and cure of contagious animal diseases.

(9) If the existing law is insufficient it should be strengthened in order to penalise a person who treats an animal so as to falsify, or with intent to falsify, the result of a test by

inoculation or otherwise which is required by a statute or regulation or otherwise, or with intent to defraud, causes any test to give a false result.

(10) The attention of veterinary institutions which grant diplomas in this country should be drawn to the importance of providing thorough instruction in the application of the tuberculin test.

(11) The law should be strengthened, if necessary, in order to penalise a person who obtains by false pretences a certificate of registration of an animal, or who fraudulently uses any such certificates.

(12) Exporters should consider whether they would prefer any reasonable alternative to the present system of charging for the carriage of live stock by passenger train, forwarding their agreed suggestions to the railway companies either directly or through the Board of Agriculture and Fisheries.

(13) Exporters should (*a*) consider the rates charged for single animals sent by goods train; and (*b*) ascertain whether stock is conveyed by the shortest route, and whether the charges are based on the shortest route; and should, if necessary, communicate with the railway companies,, either directly or through the Board of Agriculture and Fisheries.

(14) The Board of Agriculture and Fisheries should request the Breed Societies to draw the attention of their members to the fact that the Board are prepared to investigate complaints as to excessive railway charges or insufficient facilities.

(15) Official action should be taken against Shipping Combines when necessary to prevent any prejudicial effect on the export of live stock owing to the system of deferred rebate.

(16) It is desirable that the Governments of certain countries which import British live stock should be approached with the view of securing their acceptance of official export certificates issued by the Board of Agriculture and Fisheries.

As regards recommendation (6), relating to the establishment of an official testing station, Mr. T. H. Middleton, one of the members of the Committee, suggests a modification of the terms of this recommendation as follows:—

"An official testing station for applying the tuberculin test and for immunising pedigree stock against certain diseases

would be likely to prove of much value in promoting and developing the export trade. A station of this kind should in the first place be established as an experimental measure; it is probable that after a few years it would become self-supporting, and it might then be established on a permanent basis."

In support of this recommendation, Mr. Middleton points out that, were satisfactory arrangements made for testing cattle in Britain, there is substantial reason to expect that the test would be generally accepted in South Africa, and in view of the considerable export of cattle which has recently taken place from this country to South Africa, and the stringent regulations as to quarantine, it is clearly desirable in the interests of exporters that an endeavour should be made to prevent a repetition of such hindrances to trade as exist in the Buenos Aires quarantine station. The immunisation of stock against certain diseases might remove an obstacle to the development of a trade with Brazil, Venezuela, and other sub-tropical countries, since it is now possible to protect cattle from attacks of redwater by means of a vaccine; and it may in the future be possible to immunise stock against other diseases prevalent in the country for which they are destined.

SUMMARY OF AGRICULTURAL EXPERIMENTS.*

Soils and Manuring.

Continuous Growing of Wheat and Barley (*Rept. on the Woburn Field Expts., Jour. Roy. Agric. Soc., Vol.* 71, 1910).—Wheat and barley have been continuously grown at Woburn since 1876 on the same land, the manures being applied every year.

In 1910 the yields of wheat generally were well up to the average of the ten years 1897–1906. The unmanured plots gave 14·1 bush. per acre; mineral manures alone gave rather less, viz., 12·6 bush.; the produce from farmyard manure was only 18·1 bush., but rape dust gave 25·1 bush. The highest yield of wheat was 27·8 bush., from mineral manures with nitrate of soda, the latter manure being applied in alternate years (last applied in 1909). A plot on which mineral manures and sulphate of ammonia were used and which received a dressing of one ton of lime in January, 1905, gave a yield of 24·1 bush. The influence of lime in one case was clearly marked for quite thirteen years. As regards quality, the wheats as a whole were poor; the best

* A summary of all reports on agricultural experiments and investigations recently received is given each month. The Board are anxious to obtain for inclusion

were the unmanured, minerals only, and rape dust plots, the worst the nitrate of soda and sulphate of ammonia plots. Phosphate appeared to be slightly better than potash in a mixture of manures.

The barley crop generally was very poor and considerably below the average. The unmanured plots gave only 3·5 bush., the lowest produce for many years; mineral manures did better, viz., 8·4 bush., but this plot had a great deal of weed; farmyard manure yielded 17 bush., but in contrast to wheat, rape dust produced only 11·7 bush. of barley. The highest yield was 31·5 bush., from a heavy dressing of nitrate of soda with minerals; the omission of nitrate of soda for a single year reduced the yield to 15·3 bush. As a whole, the nitrate of soda plots did better than corresponding sulphate of ammonia plots even where lime had been applied with the latter. The limed plots, along witb sulphate of ammonia, showed the lime to be practically worked out after thirteen years, although, along with mineral manures in addition, its effect was still noticeable. Potash appeared to be better than phosphate in a mixture of manures. The quality of the barley was generally better than that of the wheat.

Rotation Experiments (*Rept. on the Woburn Field Expts., Jour. Roy. Agric. Soc., Vol.* 71, 1910).—This experiment is now concluded, and a summary of the results will be made by Dr. Voelcker.

Soil Surveys and Soil Analysis (*Jour. of Agric. Science, Vol. IV., Part* 2, *October* 1911).—Messrs. Hall and Russell, of Rothamsted, contribute an article to this publication on soil surveys and soil analysis. A soil survey of the counties of Kent, Surrey, and Sussex, carried out by the authors, was recently published by this Board, and the article under notice is devoted to the scientific aspects of the work. The authors point out that the chemist has great difficulties in interpreting a soil analysis in the absence of comparative figures from similar soils in the neighbourhood, and advocate the extension of soil surveys to the remaining counties of the kingdom. The article under notice contains a full description of the methods adopted in the survey of the south-eastern counties undertaken by them, and will prove of great use to investigators contemplating similar work elsewhere. Stated briefly, the objects of a soil survey are (1) to show the distribution of soils of similar agricultural properties and to define these soils in terms of their composition and properties; (2) to ascertain the relationship between the composition of soils and their known agricultural qualities; and (3) to guide agriculturists in the selection of soils appropriate for particular purposes.

The authors show how the results obtained by them fulfil these objects by discussing their analyses in the light of the information given them by farmers regarding the agricultural properties of the soils to which they relate. The investigations, it should be noticed, were not confined to purely chemical analyses. The authors lay great stress on the value of mechanical analyses of soils, by which is meant analyses based on the size and number of the soil particles irrespective of their chemical composition. For example, they find that the typical fruit soils are alike in containing 60 per cent. of "fine sand" and "silt," and 12 per cent. of "clay." (For the purposes of this work, such terms as "fine sand," "silt," &c., have been given a

of particles between 0·2 and 0·4 millimetre in diameter, "silt" as particles between 0·04 and 0·01 millimetre, and so on.) The authors go on to point out that such analyses alone do not provide sufficient criteria of the economic value of soils; they must be considered in the light of such important factors as the amount of organic matter and calcium carbonate present in the soil, and, above all, the condition of the soil in regard to water supply and retention of moisture must be taken into consideration. Climatic conditions, and, finally, the chemical analysis, also influence the interpretation of the results.

The point of most interest to the practical agriculturist in this paper is the minor position given to purely chemical considerations. In a review of an article by one of the authors in last month's *Journal* (p. 653) mention was made of the views of the Bureau of Soils, U.S.A., in regard to this question, and it was pointed out that still less consideration is given in America to the chemical analysis of soils. In the present paper the main defects of chemical analysis are stated to be that "it does not aim at finding out the actual composition of the soil . . . it does not deal with the whole of the soil, but only with the less resistant portions . . . the methods are arbitrary." On the other hand, the advantages of mechanical analysis are that it "gives a complete picture . . . it accounts for many of the peculiarities observed in cultivation." Its disadvantages are that it is restricted in its application, inasmuch as it cannot be used for chalk and peat soils (such as the fen soils), being most useful for mineral soils, *i.e.*, the sands, loams, and clays which form the greater portion of the agricultural soils of this country.

Formation of Calcium Carbonate in the Soil (*Jour. of Agric. Science, Vol. IV., No. 2, October, 1911*).—In this paper Mr. C. T. Gimingham gives an account of his investigations on the formation of calcium carbonate in the soil by bacteria. A supply of this substance is indispensable for the maintenance of fertility, and as it is constantly being removed by various processes connected with the nutrition of plants, it is necessary to explain why many soils maintain their fertility though chalk or lime has not been artificially supplied. The author has succeeded in isolating a number of bacteria which have the power of manufacturing carbonate of lime from a common constituent of plant tissues, namely, oxalate of lime, a salt which in its chemical constitution is not far removed from carbonate of lime.

Manuring of Meadow Land (*Field Expts. in Staffordshire and Shropshire, and at the Harper Adams Agric. Coll., Rept.,* 1910).—These experiments were started in 1903 in conformity with a scheme of the Agricultural Education Association, and the results for eight years are given in this report.

The field was laid down many years ago, the soil being a stiff clay loam resting upon a bed of clay overlying the red sandstone. A dressing of 1½ cwt. nitrate of soda, 2½ cwt. superphosphate, and ¾ cwt. sulphate of potash per acre gave in eight years a yield of 15 tons 11 cwt. of hay per acre, or 6 tons 7½ cwt. of hay more than the unmanured plot; valuing the hay at 50*s.* per ton makes the profit due to the use of this dressing in eight years £6 19*s.* The effect of omitting sulphate of potash was slightly to reduce the yield and the profit, while when superphosphate was left out a loss resulted compared with the un-

manured plot. Omitting nitrate of soda decreased the yield, but so slightly that the profit from the use of sulphate of potash and superphosphate was greater than that from the complete dressing. The results on plots where the three manures were used singly confirmed the conclusion that the principal requirement of the soil was phosphates. Ten tons of dung applied in 1903 and 1907 without other manuring produced a yield in eight years of 13 tons 6 cwt. of hay, with a net profit of £5 9s. Where, in addition to the dung, the complete dressing of artificials was given in the years between 1903 and 1907 and after 1907, a yield of 16 tons 8 cwt. of hay was obtained—the highest during the experiment—with a net profit of £6 7s. It will be seen that this is less profitable than the complete dressing of artificials in every year.

An experiment was commenced in 1909 to ascertain the effect of potassic superphosphate compared with superphosphate and kainit together, but no definite conclusions can as yet be drawn from it.

Manuring of Barley (*Field Expts. in Staffordshire and Shropshire and at the Harper Adams Agric. Coll., Rept.*, 1910).—Potassic superphosphate was compared with a mixture of potash and superphosphate in 1909 and 1910 for barley, the soil being a medium loam, very suitable for the crop. A dressing of kainit, superphosphate, and sulphate of ammonia proved very slightly superior to a dressing of potassic superphosphate and sulphate of ammonia having the same composition as the former dressing. The yields from potassic superphosphate and superphosphate having the same money value were almost identical. As regards the nitrogenous manure to be used along with potassic superphosphate, sulphate of ammonia proved best in 1909, and nitrate of soda in 1910, the difference between these two manures and nitrate of lime in 1910 being hardly noticeable.

Manuring of Mangolds (*Field Expts. in Staffordshire and Shropshire and at the Harper Adams Agric. Coll., Rept.*, 1910).—A series of trials upon the value of top dressings in conjunction with a complete manuring for the mangold crop was continued in 1910. The highest average result was obtained by the combined use of nitrate of soda and superphosphate as a top dressing. Superphosphate as a top dressing in combination with other manures gave somewhat variable results. Applied as a top dressing with farmyard manure, superphosphate gave a profitable return, either alone, or with 1 cwt. nitrate of soda. Nitrate of lime gave, on the whole, better results than nitrate of soda as a top dressing.

Various compound manures were tested for the mangold crop in 1909 and 1910. The composition of these manures and the resulting crops are given in the report.

Potassic superphosphate, basic slag, and superphosphate were compared as manures for mangolds in 1908, 1909, and 1910, with results, on the average, in favour of basic slag.

Manuring of Grass Land (*Experiments at Kineton, Warwick*, 1911).—The land on which this experiment is conducted by Mr. Ernest Parke had at the start been laid down in grass for about ten years, and was in very poor condition owing to neglect of manuring. Artificial manures have been used every year since 1901, and the results on the hay crop during the subsequent ten years are considered in this report

by Dr. Bernard Dyer. The average crops in this time are shown in the following tables: —

UPPER HALE FIELD.

	Cwt. per Acre.
No manure	13
5 cwt. basic slag	33½
5 cwt. basic slag, 1 cwt. sulphate of potash	35½
5 cwt. basic slag, 1½ cwt. nitrate of soda	42½
5 cwt. basic slag, 1½ cwt. nitrate of soda, 1 cwt. sulphate of potash	43
1½ cwt. nitrate of soda	33

FIVE AND THREE ACRES FIELD.

No manure	10½
3 cwt. superphosphate	30½
3 cwt. superphosphate, 1 cwt. sulphate of potash	31½
3 cwt. superphosphate, 1½ cwt. nitrate of soda	39
3 cwt. superphosphate, 1½ cwt. nitrate of soda, 1 cwt. sulphate of potash	40
1½ cwt. nitrate of soda	30

The quantities of manures were slightly different in the first two or three years. It will be seen that phosphates have produced a large increase, while potash salts have had but small effect. This is in accordance with an analysis of the soil of the fields made at the beginning of the experiment, which showed it to be very poor in available phosphoric acid, but sufficiently provided with potash. The best herbage, in which clovers and grasses flourish with equal vigour and luxuriance, is found on the plots on which phosphates and nitrates are used. On these an annual dressing of 5 cwt. of basic slag, or 3 cwt. of superphosphate, with 1½ cwt. of nitrate of soda, has given an annual gain of 30 cwt. of hay.

Manuring of Swedes (*Field Expts. in Staffordshire and Shropshire and at the Harper Adams Agric. Coll., Rept.*, 1910).—Trials have now been carried out for six years on the comparative values of nitrogenous manures for the swede crop. Money value has been made the basis of comparison, and the experiments have extended over a variety of soils and in seasons of varying character. The standard dressing given each year has included steamed bones, 4 cwt., superphosphate, 3 cwt., and kainit, 2 cwt. The amount of nitrogenous dressing applied has varied slightly with the price of the manure; 1 cwt. sulphate of ammonia has been taken as the basis, and equivalent money values of the other manures have been applied. The average results of a series of years and from the various soils show that there is but small variation in the return from the different nitrogenous dressings.

The standard dressing of 3 cwt. superphosphate, 2 cwt. kainit, 4 cwt. steamed bones, and 1 cwt. sulphate of ammonia has also been compared with a dressing in which the superphosphate and kainit were replaced by 397 lb. potassic superphosphate, the two dressings having the same cost. The average results over three years were 21 tons 18 cwt. per acre of swedes from the potassic superphosphate, and 22 tons from the superphosphate and kainit.

From 1907–10 a comparison was made of the phosphatic manures usually applied to swedes, the amounts of each used being such that their money values were equal. High-grade basic slag and steamed bones were found to be slightly inferior to low-grade basic slag with nitrate of soda, bone meal, or dissolved bones.

Basic slag and superphosphate were compared as manures for swedes in respect of the feeding value of the roots, half-acre plots being treated with these two manures on an equal money value basis. The roots were fed off by 60 sheep (30 on each plot), the increases in live weight being noted, and the sheep were sold in the market. The animals from the superphosphate plot gained 2 qr. more in weight than those from the basic slag plot, and realised 1*s.* 10½*d.* more per cwt., so that the results were in favour of superphosphate.

Various compound manures of different manufacturers for swedes were tested in 1909 and 1910. The composition of the manures and the yields in 1909 and 1910 are given in the report.

Manuring of Potatoes (*Monmouthshire Agric. Educ. Com., Potato Trials,* 1910).—The manurial trials were carried out at two centres with a number of different varieties, the point tested being the effect of artificials. It is considered that the experiments go to show that the flavour, quality, and keeping properties of potatoes grown without artificial manure are better, though the bulk obtained is smaller, than with artificials.

FIELD CROPS.

Varieties of Potatoes (*Monmouthshire Agric. Educ. Com., Potato Trials,* 1910).—A large number of varieties were tried, Scotch, Irish, and English seed being used, and the crops, together with the result of a cooking trial of each variety, are given.

Varieties of Wheat (*Bedfordshire C.C. Agric. Educ. Com., Rept. on Wheat and Oat Plots,* 1911).—Fifteen varieties of wheat were grown in 1911 on a well-drained, heavy clay soil. The crops per acre this year and the average crops for the five previous years are shown in the following table:—

	Average yield for five years previous to 1911. Bushels.	Yield 1911 Bushels.
Kinver Red (Webb)	43	31
Square Head Master	41½	34
White Stand Up (Carter)	41	33
Red Stand Up (Carter)	40	35
Red Standard (Webb)	40	33
Blue Chaff Rivetts (Percival, Reading College)	Not grown	39
Burgoyne's Fife (Camb. Univ.)	,,	35
Little Joss (Camb. Univ.)	,,	35
Red Fife (Canadian)	32	13

It is concluded that on heavy clay land it is advisable to grow a red in preference to a white variety. Red Fife was by far the best sample of wheat, but does not yield well enough. Little Joss, a new Cambridge wheat, was one of the best samples after Red Fife.

WEEDS AND PLANT PESTS.

The Action of Carbon Dioxide on Bordeaux Mixtures (*C. T. Gimingham, Jour. Agric. Science, Vol. iv., No.* 1, *May,* 1911 : *Cambridge University Press*).—Mr. Pickering has shown that when carbon dioxide is passed through Bordeaux mixture the basic sulphates contained in it are decomposed with the formation of copper sulphate. To the soluble copper sulphate liberated in this way he attributes the main fungicidal action of Bordeaux mixtures.

In the investigation described in this paper, however, Mr. Gimingham found that the whole of the copper thus brought into solution by the action of CO_2 for a short time was reprecipitated in an insoluble form on the removal of the CO_2 by allowing the liquid to stand exposed to the air or by passing air through it. It appears therefore that though copper sulphate is formed by the action of CO_2 on Bordeaux mixture, it is immediately changed into basic copper carbonate, which is only soluble in the presence of CO_2. This, though quite consistent with Pickering's work, is difficult to reconcile with the view that atmospheric carbon dioxide is the important factor in bringing into play the fungicidal properties of Bordeaux mixtures. To test this under more practical conditions, Bordeaux mixture was allowed to stand in a shallow layer exposed to the air, or had a current of air drawn through it, for long periods, but though a portion of the copper could be changed into the carbonate by atmospheric carbon dioxide, no more than a trace was kept in solution. The conclusion drawn from these experiments is that, although the action of carbon dioxide in excess on the compounds present in Bordeaux mixtures brings copper into solution, yet it does not appear that sufficient copper is held in solution by carbon dioxide derived from the atmosphere to be of importance as a fungicide. It is difficult to apply experimental results directly to practical conditions, because we have no accurate knowledge of the state of affairs in a film of dew or rain on the surface of a leaf; possibly traces of carbonate of copper are present in solution under some conditions, but that there should ever be enough carbon dioxide to dissolve more than very minute amounts seems most unlikely.

The Fungicidal Action of Bordeaux Mixtures (*B. T. P. Barker and C. T. Gimingham, Jour. Agric. Science, Vol. iv., No.* 1, *May,* 1911 : *Cambridge University Press*).—The problem of the manner in which Bordeaux mixture exerts a fungicidal action, apart from its physiological effect on plants, is generally accepted to be equivalent to the question of how the copper, which is present in an insoluble form, is rendered soluble.

A purely chemical explanation—that copper is brought into solution by the action of the carbon dioxide of the air—has been rejected by one of these authors in the paper noticed above. Two other theories have been advanced, viz., that either the leaves, or the fungus itself, convert some of the copper into the soluble form by which the fungus is poisoned. The supposition that excretions from the leaves exert a solvent action was examined by some experiments, in which jars containing distilled water and Bordeaux mixture precipitate were fixed round growing shoots of fruit trees. In all cases but

Bordeaux mixture without excess of lime, the leaves brought some copper into solution. Care was taken to choose uninjured shoots, but it is very difficult to find leaves quite free from small injuries. The small amount of copper dissolved by exudations from these small injuries increases the injuries, and these then proceed to dissolve more copper. Experiments with single leaves supported this view, and though the results are inconclusive as to the power of uninjured leaves to exert a slight solvent action, the authors are inclined to attribute the action rather to such injuries to the foliage.

The question of the existence of a solvent action of the fungus itself upon Bordeaux precipitates has hitherto not been settled. In this investigation hanging drop cultures of spores were made with Bordeaux mixture and with the filtrate from it. In the filtrate germination and subsequent growth were fairly vigorous, while in the drops of the Bordeaux mixture germination was rare. Diffusion tubes were then used to separate Bordeaux precipitate from its filtrate, when the spores germinated both in the filtrate outside the diffusion tubes and in the diffusion tubes containing the precipitate, but in the latter case only at a little distance from the precipitate itself. In the final experiments films of Bordeaux precipitate were allowed to dry on cover-slips, and films of *Nectria* conidia were superimposed on these films, overlapping them. After 24 hours in a moist atmosphere there was a sharp limit between dead and living conidia which coincided practically exactly with the edge of the copper film. Beyond the copper zone nearly all the conidia were living, and had germinated in many cases, especially in the region farthest removed from the copper. From these results it is concluded that there is a solvent action on the part of the fungus, which is, however, not strong enough to produce serious toxic effect except when direct contact with particles of the insoluble copper compound occurs. The action is purely local and cannot result in the bringing into solution of sufficient copper to exercise a general fungicidal action over the whole surface of a leaf. Some spores, *e.g.* *Puccinia* spores, which have a thick resistant coat, may be uninjured by contact with the copper compound, and growth will apparently be possible if the germ tube escapes contact. As far as practical considerations are concerned, this work would support the conclusions arrived at by fruit-growers, viz., the necessity for thorough spraying, so as to coat as completely as possible the surfaces liable to infection, the importance of the finely divided form of the copper precipitate, and of the adhesive properties of the spray. It explains also how Bordeaux mixture may be effective immediately after application.

Silver-Leaf Disease (*Jour. of Agric. Science, Vol. IV., No. 2, October, 1911*).—In a paper on Silver-Leaf Disease, Mr. F. T. Brooks gives an account of investigations carried out by him at Cambridge with reference to this disease. The results confirm the conclusions of Prof. Percival and Mr. Pickering (summarised in this *Journal,* vol. xviii., p. 38) that the disease is caused by the fungus *Stereum purpureum.* The author succeeded in producing the disease in healthy plum-trees by inoculating with the spores of the fungus. He is of opinion that the disease is probably communicated in this way from diseased to healthy trees. Mr. Brooks's investigations have been aided by grants from the Development Fund.

Destruction of Hedge Mustard (*Biedermann's Zentralblatt für Agrikulturchemie, October,* 1911).—Calcium cyanamide, sulphate of iron, and three patent preparations, were compared as to their relative effectiveness in destroying hedge mustard which had strongly infested a field of oats.

Sulphate of iron was found to be the most effective material as well as the cheapest. The quantity used for spraying was 53 gallons per acre of a 22 per cent. solution. Calcium cyanamide was strewn over the field at the rate of 80, 90, and 180 lb. per acre, the best results being given by the largest quantity.

HORTICULTURE.

Varieties and Pruning of Apples (*Warwickshire C.C. Educ. Com., Fruit Plot, No. 1, Ann. Rept.,* 1909–10).—Thirty-six varieties of apples have been grown on the plot, and the crops of each in the four years 1906–9 are classified under the headings, "very heavy," "heavy," &c. The pruning experiments are considered to have shown sufficiently clear results to indicate the most suitable methods of dealing with numerous varieties, when grown as bush trees on the Broad-leaved Paradise stock, and directions are given for six methods of pruning found most suitable for certain groups of varieties.

MISCELLANEOUS.

Effect of Atmospheric Impurities upon Vegetation near an Industrial Town (*Charles Crowther and A. G. Ruston, Jour. Agric. Science, vol iv., Pt. 1, May,* 1911: *Cambridge University Press*).—This investigation comprises a three-years' series of analyses of rain collected at Garforth, a twelve-months' series of analyses of rain collected in Leeds, and researches into the effect of atmospheric impurities upon vegetation. An extensive series of analyses of rain falling at Rothamsted has already been published, and these results are probably typical of the essentially rural parts of the country, fairly remote from the sea. The Garforth farm, however, is situated six miles from Leeds in the neighbourhood of coalfields, and the results obtained there may probably be taken as applicable to the large tracts of agricultural land situated in the smoke-infested localities so extensive in area in many parts of the country. The Leeds samples were collected at ten different stations, ranging from markedly industrial to purely residential suburban districts. The following table shows in pounds per acre per annum the dissolved impurities in the Garforth rain and in that of the station in Leeds which had on the whole the most impure rain, and the Rothamsted results are added for comparison:—

	Nitrogen.	Sulphur.	Chlorine.	Free acid.
Rothamsted	3·84	17·41	14·87	—
Garforth	8·37	95·7	20·89	20
Leeds (Station 2)	15·5	215·0	198·0	90

The nitrogen includes that brought down as nitrates and nitrit and not that in the form of organic matter, which amounted addition, to 1·56 lb. per acre at Garforth, 2·9 lb. at the Leeds stati and 4·7 lb. at another station in Leeds. Estimations were also m of the suspended matters (ash, tar, and soot) in Leeds rain, and amount varied at the different stations from [illegible] lb. to [illegible] lb.

Garforth results is the relatively high amounts of each of the impurities. The results bear unmistakable evidence of the fact that the impurities have their origin largely in the combustion of coal, this being the most obvious source of the acid which occurs in such appreciable quantities in the rain. Very large areas of such smoke-infested agricultural land are to be found in the north.

The second part of the investigation was concerned with the effect on plant growth and the soil of the state of the atmosphere thus ascertained. The intensity of the daylight throughout the day was measured at six stations in Leeds, and was found to vary regularly in inverse ratio to the amount of suspended matter in the air, the effect being so considerable that at a station in the industrial part of the city the average intensity was 40 per cent. less than at a suburban station. These suspended impurities also check vegetation by settling on the leaves, and thus shutting out further light, and clogging the stomatal openings. The assimilatory powers for carbon dioxide of laurel leaves gathered in different parts of the city were measured, with the result that if the rate of assimilation be represented by 100 in leaves from the suburban station with the purest air, at the other stations it varied down to only 11½. As regards the dissolved impurities brought down in rain, detrimental action is probably confined to the free acid and the lower sulphur compounds (SO_2, H_2S, &c.), as there is no reason to believe that the nitrogenous impurities and perhaps the chlorides and sulphates, will be other than beneficial. An experiment with timothy grass showed the effect of the application of acidulated water to the soil. Boxes of the grass, sown in 1908, were watered at the rate of the average Garforth rainfall with water containing from one to thirty-two parts per 100,000 of sulphuric acid, and with Garforth rain water, neutralised Garforth rain, and Leeds rain. The weights and composition of the material grown each year were ascertained. In every case the yield steadily decreased with increased acidity of the water, and by 1910 the grass watered with the water containing sixteen and thirty-two parts of acid was dead. Analysis of the grass showed that the nitrogen content was reduced, and the content of crude fibre increased by the acid. This inferiority in nutritive value was quite evident even in the case of the grass watered with water containing only one part of acid per 100,000, a proportion that is about the average in Garforth rain, and it becomes of importance to ascertain to what extent such deterioration can be traced on a large scale in the meadows of smoke-infested regions. Chemical analysis of the soil, which had been used in these grass experiments for three years, showed a distinct correlation between the amount of acid applied and the constituents of the soil except in respect to total nitrogen. Increasing acidity led, on the one hand, to diminished content of nitrates and carbonates, and to diminished absorptive power for oxygen, but on the other hand to increased content of the easily soluble mineral ingredients and ammonia. The bacterial flora of the soil was strikingly influenced by the acid, the total number of bacteria diminishing rapidly with increasing acidity, this being reflected also in diminished activity as regards ammonia production, nitrogen fixation, and, above all, nitrification. The greater check to the nitrifying than to the ammonia-producing organisms

explains the increased ammonia content of the treated soils noted above.

It is clear from this investigation that the atmosphere in and around a large industrial city such as Leeds is relatively highly charged with impurities, many of which exert a marked deleterious effect upon plant growth. The impurities are most abundant in the industrial quarters of the city, but are disseminated over very large areas, especially in the directions of the prevailing winds.

OFFICIAL NOTICES AND CIRCULARS.

Regulations and Awards, Show of Thoroughbred Stallions, 1912.

The Regulations for the show of thoroughbred stallions suitable for breeding half-bred horses, to be held at the Royal Agricultural Hall, Islington, in conjunction with the Hunters' Improvement Society, on March 12th, 13th, and 14th, 1912, have recently been issued by the Board, and give particulars of the King's Challenge Champion Cup, King's Premiums, and Super-Premiums, to be awarded at the show.

PARTICULARS OF AWARDS.

King's Champion Challenge Cup.—His Majesty the King has been graciously pleased to offer for competition a cup for the Champion Stallion in the Show, to which a King's Premium is awarded, to be selected from amongst the stallions recommended for Super-Premiums. The cup will be held by the winner for one year only, and shall then be returned to the Board of Agriculture and Fisheries. A gold medal will also be awarded by the Board of Agriculture and Fisheries to the owner of the Champion Stallion.

King's Premiums.—Fifty King's Premiums are offered by the Board of Agriculture and Fisheries for Thoroughbred Stallions not under four nor over twenty years old.

The average value of a Premium is £176 5*s.*, paid by the Board, as follows:—

	£	*s.*	*d.*
Premium of 100 guineas—half paid at the time of award and the other half after the close of the service season	105	0	0
Service fee of £1 1*s.* a mare (average number, 50), paid after the close of the service season ...	52	10	0
Foal fee of 12*s.* 6*d.* a foal (average number, 30), paid after the close of the foaling season ...	18	15	0
	176	5	0
In addition, a service fee of £2 a mare (average number, 50) is chargeable to the owner	100	0	0
Average earnings	276	5	0

Fees are paid by the Board in respect of (but not exceeding) 90 mares, and the earnings of a stallion serving that number would be approximately £410.

Super-Premiums.—Super-Premiums of the value of 100 guineas, paid at the time of award, will, in addition to the ordinary Premium,

be given to selected stallions of exceptional merit. Not more than 10 will be awarded in 1912. The owner of a stallion is required to state on the entry form whether he enters his stallion for competition for a Super-Premium. If he does so enter it, he is to sign an undertaking agreeing to exhibit the stallion (if awarded a Super-Premium in 1912) at the Show of Premium Stallions in 1913 in a class for which it is eligible in accordance with the Regulations of the Board.

If he fails so to exhibit the stallion he is to forfeit and pay to the Board the value of the Super-Premium, *i.e.*, One Hundred Guineas.

Entries and Awards.—Exhibitors may enter any number of stallions in each class, and may take *all* Premiums awarded to them.

The last day for entry is Monday, January 29th, 1912, and for post entry, Monday, February 5th, 1912.

Every stallion must be registered under the Board's Registration Scheme before it can be accepted for entry.

Registration of Stallions.

The Board of Agriculture and Fisheries are prepared to entertain applications for the registration of stallions of any recognised breed. No charge is made for registration unless the service fee exceeds £10.

The Board issue a certificate certifying the soundness and suitability for breeding purposes of every stallion accepted by them for registration.

No application can be entertained in respect of a stallion under three years of age or of a stallion which has not been entered or accepted for entry in the recognised stud-book of its breed.

The Hunters' Improvement Society, the Polo and Riding Pony Society, the Shire Horse Society, the Hackney Horse Society, and the Suffolk Horse Society, have arranged to publish in their respective stud-books a list of stallions registered by the Board, and the two first-named societies have also decided to exempt stallions registered by the Board from veterinary examination at their shows.

The acceptance of a stallion for entry at the Spring Show of Thoroughbred Stallions held at the Agricultural Hall, Islington, is conditional upon its having been registered by the Board. Applications for the registration of such stallions must be made before the 1st January next.

The registration year now terminates on October 31st in each year.

Forms of application for registration and copies of the regulations applicable thereto, can be obtained free of charge from the Secretary, Board of Agriculture and Fisheries, 4, Whitehall Place, London, S.W.

Research Scholarships in Agricultural Science.

The Board of Agriculture and Fisheries have awarded Research Scholarships in Agricultural Science to the following gentlemen:—P. G. Bailey, B.A. (Camb.); J. Clayton, B.A. (Camb.); J. T. Edwards, M.R.C.V.S.; E. T. Halnan, B.A. (Camb.); J. Hammond, B.A. (Camb.); J. A. Hanley, A.R.C.S.; G. E. Johnson, M.Sc. (Birm.); C. G. P. Laidlaw, B.A. (Camb.); A. E. Lechmere, M.Sc. (Bristol); J. W. Lesley, B.A. (Camb.); A. Neville, B.Sc. (Lond.), F.I.C., F.C.S.; G. T. Spinks, B.A. (Camb.).

These scholarships have been established in connection with the scheme for the promotion of scientific research in agriculture, for the

purposes of which the Treasury have sanctioned a grant to the Board from the Development Fund. The scholarships, which are of the annual value of £150, and are tenable for three years, have been established in order to train promising students, under suitable supervision, with a view to their contributing to the development of agriculture, either by carrying out independent research, or by acting in an advisory capacity to agriculturists.

Departmental Committee on Foot-and-Mouth Disease.

The President of the Board of Agriculture and Fisheries has appointed a Departmental Committee to inquire into the circumstances of the recent outbreaks of foot-and-mouth disease, and to consider whether any further measures can be adopted to prevent their recurrence.

The Committee will be constituted as follows: The Right Hon. Sir Ailwyn Fellowes, K.C.V.O. (Chairman); Sir Charles D. Rose, Bart., M.P.; Sir Harry Verney, Bart., M.P.; Sir J. Bowen Bowen-Jones, Bart.; Mr. Charles Bathurst, M.P.; Mr. William Field, M.P.; Mr. John Hinds, M.P.; Mr. George R. Lane-Fox, M.P.; Mr. Richardson Carr; Major E. M. Dunne; Mr. E. E. Morrison; Mr. E. P. Nunneley.

Mr. W. H. F. Landon, of the Board of Agriculture and Fisheries, will act as Secretary.

Foot-and-Mouth Disease.

The Board of Agriculture and Fisheries have withdrawn, as from December 8th, all the restrictions which were imposed by them on the movement of animals in connection with the recent outbreaks of Foot-and-Mouth Disease on premises near Bridgwater, Somerset.

The existence of Foot-and-Mouth Disease amongst cattle at Halfway Farm, Tintinhull, Matlock, Somerset, was confirmed on 7th inst., twelve animals having been found to be affected with the disease.

The usual precautions have been taken to prevent the spread of the disease, and an Order has been issued prohibiting the movement of animals in a large area surrounding the affected farm.

MISCELLANEOUS NOTES.

Notes on Agriculture Abroad.

Beef Supplies in the United States.—From a report received from the Foreign Office, it appears, according to the *National Provisioner*, that the beef prospect is a dubious one. Good cattle are exceedingly scare, and high in price, but coarser beasts have been very plentiful, and have been a drag upon the market. Cattle-feeding will be at a minimum this winter, and there is an apparent shortage of cattle in the country. Regular feeders will be busy, but those who, taking advantage of the cost of feeding stuffs and the state of the market, occasionally feed, are likely to abstain. The shortage of hay, and the temptation to sell corn, instead of feeding it, are given as reasons.

Heavy market receipts of Western cattle indicate the further depletion of feeder supplies. Should beef production suddenly become popu-

lar, there is not the basis to work upon, as the cattle are not in the country or on the feed lots. It will take at least two years to replenish stock and get going again, even if high prices this winter stimulate a resumption of beef production.

Importation of British Pedigree Bulls into the Gold Coast.—In the Report on the Northern Territories of the Gold Coast for 1910 (*Colonial Reports, Annual,* No. 683) it is stated that an attempt was made in 1909 to introduce English bulls with a view to improving the local breed of cattle. The animals were Aberdeen Angus bulls, but were not suitable to the country, and though they left England in good condition did not live to reach the Northern Territories of the Gold Coast. Three more bulls have, however, been ordered from England, and throughout the journey will be under the charge of a veterinary surgeon who has selected breeds more suitable to the country.

Notes on the Weather in November.

The weather during the *first* week in November (October 29th to November 4th) was in a very unsettled and stormy condition over the whole of Great Britain. Rain fell daily over a large area, some of the amounts being very heavy. The fall over the whole week was either "heavy" or "very heavy," except in England N.E. Temperature was "unusual" in two districts, viz., England N.E. and the Midland Counties, but "moderate" elsewhere. Bright sunshine was less than the normal over the western parts of the country, but more in the eastern districts.

Conditions were again unsettled throughout the *second* week. Rain was frequent, and occasionally very heavy, but fair, bright intervals were not uncommon; only in England N.E. was the rainfall below the normal; the excess above the normal in England S.E. and the English Channel was very large. Temperature was below the average in all districts, but the amount of bright sunshine was above the average to a considerable extent in some English districts.

Dull and unsettled weather prevailed again in the *third* week. Over a large portion of Great Britain rain was experienced daily, some of the amounts being very large. Sleet and snow were common in the north and east of Scotland late in the week. Taking the week as a whole the rainfall was "very heavy" in England E. and Scotland E., and, with the exception of the Midland Counties, "heavy" elsewhere. Temperature was above the normal in all districts except Scotland N.; in England E. the excess was as much as 4·6°, 60° being recorded early in the week. Bright sunshine was either "moderate" or "scanty."

Precipitation, frequently in the form of snow, sleet, or hail, occurred on several days of the *fourth* week in the eastern and northern parts of Great Britain; elsewhere, however, very light falls of rain were recorded, the deficit from the average being generally very large. The temperature over the country was "deficient," except in the Midland Counties. The amount of sunshine recorded varied, being above the average in the western section, and below or about equal to the average in the eastern section of Great Britain.

Produce of Potato and Root Crops.

The following preliminary statement shows the estimated total produce and yield per acre, of the potato and root crops in Great Britain in the year 1911, with comparisons for 1910, and the average yield per acre of the ten years 1901–10:—

Crops.		Estimated Total Produce.		Acreage.		Average Estimated Yield Per Acre.		Average of the ten years. 1901–1910.
		1911.	1910.	1911.	1910.	1911.	1910.	
		Tons.	Tons.	Acres.	Acres.	Tons.	Tons.	Tons.
Potatoes	England ...	2,674,790	2,467,179	402,512	376,834	6·65	6·55	6·06
	Wales	180,246	131,660	26,667	26,013	6·76	5·06	5·06
	Scotland ...	975,182	878,300	142,629	136,837	6·84	6·42	6·30
	Great Britain	3,830,218	3,477,130	571,808	539,684	6·70	6·44	6·08
Turnips and Swedes.	England ...	9,317,159	16,531,832	1,066,678	1,064,404	8·73	15·53	13·53
	Wales	828,874	1,000,613	57,947	58,494	14·30	17·11	15·60
	Scotland ...	6,251,560	8,162,573	438,816	442,447	14·25	18·45	16·37
	Great Britain	16,397,602	25,695,018	1,563,441	1,565,345	10·49	16·41	14·40
Mangold	England ...	7,245,046	9,105,471	438,855	429,457	16·51	1·20	20·11
	Wales	191,322	205,468	11,154	11,057	17·15	8·58	17·96
	Scotland ...	43,209	42,056	2,252	2,265	19·19	18·57	17·76
	Great Britain	7,479,577	9,352,995	452,261	442,779	16·54	21·12	20·04

NOTE.—*The yield per acre of potatoes is slightly larger than in 1910, while the total production, owing to an increase of more than 30,000 acres, is some 350,000 tons more than in 1910. Turnips and swedes have yielded only 10½ tons per acre in Great Britain, the Scottish returns being much better than the English, and little more than two tons below the average, whereas in England the deficiency is nearly 5 tons. The total of nearly 16½ million tons represents a shortage of about 6½ million tons as compared with the average of the past 10 years, and the crop is the smallest since 1899. Mangolds are returned at 3½ tons per acre below the 10 years' average, being the lowest yield since 1896, while the total of under 7½ million tons is the smallest since 1903, in which year there were, however, 50,000 fewer acres under the crop than at present.*

The preliminary statement of the produce and yield per acre of the corn, pulse, and hay crops was issued on the 3rd inst., and that of the produce and yield of hops on October 12th last.

Crop Conditions in Great Britain on December 1st.

The Crop Reporters of the Board, in reporting on the crops and the agricultural conditions on December 1st, state that November, on the whole, proved favourable to autumn work, which is now generally well forward. In certain localities the heavy rainfall had hindered operations to some extent, but in these good progress had generally been already made in October

everywhere been rendered workable during the month, so that in very few districts was the autumn work behindhand.

As a consequence, the bulk of the wheat—about 80 per cent.—had been got into the ground by December 1st. In the east of England probably about 85 per cent. had been sown, and about 75 or 80 per cent. in the other parts of England. As compared with the same date last year, the area sown appears to be about 5 per cent. greater, the increase (in England) being perhaps the greatest in the south-west and least in the south-east, while the great corn-growing districts of the east were about 7 per cent. higher than on December 1st, 1910. In Scotland the area sown was perhaps 10 per cent. less than at the same date last year.

The condition of the young wheat seemed everywhere satisfactory, both as regards healthiness and general growth.

Mangolds had practically all been lifted, and stored in good condition; the quality is very generally good. The roots are nearly everywhere small in size. The recently published preliminary returns showed that mangolds have yielded 16½ tons per acre this year, the total production of under 7½ million tons being nearly 2,000,000 less than in 1910, and the smallest total since 1903. Turnips and swedes are very generally poor or bad in quality, and in many cases are not expected to keep well. Large areas are, of course, being, as is usual, fed off on the ground, and in some districts this practice is being extended this year, partly because the turnips are often not worth lifting, and partly because the roots were still growing, especially in the north. The total production is estimated at 16,400,000 tons (10¼ tons per acre only), or no less than 9,300,000 tons less than in 1910; the Scottish returns being much better than the English. The yield of potatoes was above the average by ⅜ of a ton per acre, the 6·7 tons per acre representing a total production of 3,830,000 tons, or some 350,000 tons more than in 1910.

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Notes on Crop Prospects Abroad.

The *Bulletin of Agricultural Statistics* for November, 1911, issued by the International Institute of Agriculture, shows the production of the cereal crops this year from information received up to November 15th. The countries for which it is possible to give an approximate estimate of the production of wheat, rye, barley, and oats are as follows:—In Europe: Prussia, Belgium, Denmark, Spain, France, Great Britain, Ireland, Hungary (including Croatia and Slavonia), Italy, Luxemburg, Netherlands, Roumania, Russia in Europe (63 governments), Switzerland; in America: Canada and United States; in Asia: India, Japan, Russia in Asia (10 governments); in Africa: Algeria, Egypt, Tunis. The principal alterations are in the production of wheat and rye in Russia in Europe, referred to below.

Wheat.—The production of wheat in Russia in Europe is now estimated to be 68,462,000 qr., a decrease of 759,000 qr. on the estimate given in the previous Bulletin. The total production for all the countries this month is 286,488,000 qr., as compared with 285,818,000 qr.

in 1910, or an increase of 0·2 per cent.; while the total area harvested exceeds that of last year by 3·3 per cent.

Rye.—The production of rye in Russia in Europe is now estimated to be 86,592,000 qr., a decrease of 5,071,000 qr. on the estimate in the previous Bulletin. The total production of rye in all the countries specified (excluding Great Britain, India, Japan, Egypt, and Tunis) is 154,517,000 qr., as compared with 165,361,000 qr. last year, or a decrease of 6.6 per cent. The area harvested is greater than that of 1910 by 1·9 per cent.

Barley.—The total production in the above-named countries, with the exception of India, is estimated to be 145,002,000 qr., as against 145,825,000 qr. last year, or a decline of 0·6 per cent. The area harvested nearly equals that of 1910.

Oats.—The total production in the countries specified above, excluding India and Egypt, is now estimated to be 347,203,000 qr., as compared with 382,365,000 qr. last year, a decrease of 9·2 per cent. The area harvested is very slightly less than in 1910.

Maize.—The estimated preliminary figures for Spain, Hungary, Italy, Roumania, Russian Empire, Switzerland, Canada, United States, Algeria, and Tunis place the production at 378,579,000 qr., as compared with 425,095,000 qr. last year, which is a decrease of 10·9 per cent.

Sugar-beet.—The official figures of production in Prussia, Belgium, Denmark, Hungary, Roumania, Russia, and Servia give a total output of 22,445,000 tons, as compared with 29,028,000 tons last year, a decrease of 22·7 per cent., although the area under the crop this year exceeds that harvested in 1910 by 11·1 per cent. The greatest decrease has taken place in Prussia, where the yield is only 5,139,000 tons, against 10,424,000 tons last year.

The following supplementary notes are given:—

Argentina.—The final returns of the area under wheat are 17,036,000 acres, oats, 2,547,000 acres, and rye, 37,000 acres.

Chile.—The areas sown to wheat and barley are 1,852,000 acres and 370,000 acres respectively. The estimated yield of wheat is 21 bush. per acre, and of barley 41 bush. per acre. The condition of wheat and barley is good.

Australia.—The area under wheat for the crop year 1911–12 is 7,902,000 acres, as compared with 7,207,000 acres last year; the condition of the crop on November 1st was average. The area under oats is 689,000 acres.

New Zealand.—The condition of wheat and oats on November 1st was average, and of barley 20 per cent. above average.

Austria.—The condition of winter wheat is 2·4; winter rye, 2·2; sugar-beet, 3·6; clover, 3·6; meadow land, 2·8; and pasture, 3·1. The final estimates place the maize and potato crops at 3·3 (1 = very good, 2 = above average, 3 = average, 4 = below average, 5 = very poor). (*Deutscher Reichsanzeiger*, November 28th.)

Germany.—The official results of the harvest of 1911 are given below, with similar figures for 1910 (*Deutscher Reichsanzeiger*, December 2nd):—

	1911. Qrs.	1910. Qrs.
Wheat	18,671,255	17,730,624
Barley	17,411,132	15,995,188
Oats	54,422,560	55,809,066
Rye	49,893,583	48,263,743
	Tons.	Tons.
Potatoes	33,821,782	42,769,796
	Tons of hay.	Tons of hay.
Clover (including "Clover and Grass Mixtures" ...	6,956,833	11,751,705
Lucerne	1,074,274	1,631,569
Permanent Grass for Hay { Irrigated	2,159,089	2,762,914
Permanent Grass for Hay { Other ...	17,495,203	25,033,182

Argentina.—The Buenos Aires *Handels-Zeitung* of November 4th states that the recent rains which extended over the whole agricultural territory have assured a good wheat yield. The condition of the crop at present is excellent. A total yield of about 5,500,000 tons is anticipated. (*Dornbusch*, November 25th.)

Denmark.—According to a preliminary report of the Statistical Office, this year's cereal crop was very satisfactory in yield. Yield and condition of wheat and rye vary considerably in the different districts; the quantity is given as above middling and the condition as much above middling. The yields of barley and oats were also much above average, except on the islands, where they were somewhat smaller. Potatoes had suffered from the drought and field vermin, and crop results were therefore less favourable. The potato crop may still be called an average one, but the yield of sugar-beets is below middling, though excellent in quality. (*Dornbusch*, November 30th.)

Canada.—The following report on crop conditions in the first week of November has been issued by the Ontario Department of Agriculture. *Fall Wheat:* The quality of this grain ranges from fair to good, with occasional reports of the sample being light in weight. The average yield per acre, 21·4 bush., is considerably below that of recent years. *Spring Wheat:* Comparatively little now grown in the province. This year's produce is a fairly good crop in every way. *New Fall Wheat:* In the western half of the province, where most of the fall wheat is raised, a slightly increased area has been put in. The bulk of the new seeding found a good bed, and the young wheat was looking well. *Barley:* The crop is practically free from discoloration, but the bulk of the grain is not as plump as usual. The yield, 26·3 bush. per acre, is close to the average. *Oats:* Oats were relatively the poorest of the cereals, as to both yield and quality. The grain is light in weight. The yield per acre is estimated at 31·4 bush. per acre, as against an average yield of 35·5 bush. per acre.

Russia.—From a report received from the Foreign Office the condition of the winter sowings of rye, wheat, and barley up to October 28th is "unsatisfactory" in one government only; "satisfactory or more than satisfactory" in 58 governments; "fairly good" in eight governments, and "good" in seven governments.

United States.—The Crop Reporting Board of the Bureau of Statistics estimates the newly-seeded area of winter wheat to be 0·9 per cent larger than the revised area sown in the fall of 1910, this being

equivalent to a total acreage of 32,213,000 acres. The condition of winter wheat on December 1st was 86·6, as compared with 82·5 in 1910, and 89·9 the mean of the December averages for the past ten years. The newly seeded area of rye is estimated as being 0·9 per cent. larger than the revised area sown in the fall of 1910, or 2,436,000 acres altogether. The condition of rye on December 1st was 93·3, as compared with 92·6 in 1910, and a ten-year average of 92·9. (*Dornbusch*, December 7th.)

Potatoes on the Continent.—The estimated production of potatoes in *France*, as published in the *Journal Officiel* of November 25th is 11,343,000 tons, as compared with 8,271,000 tons last year. From reports received from the Foreign Office the potato crop in the district of Nantes is inferior as regards quantity to that of 1910, but very superior as regards quality. The crop was harvested in favourable dry weather, and is expected to keep well. In the district of St. Brieuc all potatoes are sound and plentiful, and there is a good crop in the Department of Morbihan. In *Belgium*, around Bruges and district, the potato crop has been far in excess of the previous year. The yield has averaged some 14 tons to the acre. In Liége and district the potatoes, though somewhat small, are of excellent quality, and it is estimated that the crop will be considerably larger than last year.

Sugar-beet in France.—The estimated production of sugar-beet in France, as published in the *Journal Officiel* for November 25th, is estimated to be 3,799,000 tons, as compared with 5,089,000 tons in 1910.

Prevalence of Animal Diseases on the Continent.

The following statement shows that, according to the information in the possession of the Board on December 1st, 1911, certain diseases of animals existed in the countries specified:—

Austria (for the period November 15th—22nd).

Anthrax, Blackleg, Foot-and-Mouth Disease (total of 77,529 Höfe now infected), Glanders and Farcy, Swine Fever, Swine Erysipelas, Sheep Scab, Rabies, Tuberculosis.

Belgium (for the period October 1st—15th).

Anthrax, Blackleg, Rabies, Foot-and-Mouth Disease (1,069 "foyers" in 372 "communes").

Bulgaria (for the period November 6th—14th).

Anthrax, Glanders and Farcy, Rabies, Sheep-pox, Sheep Scab, Swine-fever.

Denmark (month of September).

Anthrax, Foot-and-Mouth Disease (4 cases).

France (month of September).

Blackleg, Glanders and Farcy, Rabies, Sheep-pox, Sheep-scab, Swine-fever, Swine Erysipelas, Foot-and-Mouth Disease (20,729 "étables" in 3,124 "communes").

Germany (for the period November 1st—15th).

Glanders and Farcy, Swine-fever, Foot-and-Mouth Disease (20,241

Holland (month of October).

Anthrax, Foot-rot, Swine Erysipelas, Foot-and-Mouth Disease (4,391 outbreaks in 11 provinces).

Hungary (for the period October 25th—November 1st).

Anthrax, Glanders and Farcy, Rabies, Swine Erysipelas, Swine-fever, Foot-and-Mouth Disease (total of 25,265 "cours" now infected), Sheep-pox, Sheep-scab.

Italy (for the period October 16th—22nd).

Anthrax, Glanders and Farcy, Swine Erysipelas, Swine-fever, Foot-and-Mouth Disease (452 new cases entailing 4,684 animals), Blackleg, Sheep-scab, Rabies.

Montenegro (for the period October 1st—15th).

Glanders, Foot-and-Mouth Disease (96 "étables" infected in 13 "communes").

Norway (month of October).

Anthrax, Blackleg.

Roumania (for the period November 4th—13th).

Glanders and Farcy, Foot-and-Mouth Disease, Pleuro-pneumonia, Rabies, Swine Erysipelas, Swine-fever, Sheep-pox, Anthrax, Blackleg.

Russia (month of June).

Anthrax, Glanders and Farcy, Pleuro-pneumonia, Rabies, Sheep-pox, Swine Erysipelas, Swine-fever, Foot-and-Mouth Disease (422,045 cases in 5,635 "communes").

Servia (for the period November 4th—11th).

Rabies, Sheep-pox, Foot-and-Mouth Disease (185 animals newly infected in 5 "arrondissements").

Spain (month of September).

Anthrax, Blackleg, Foot-and-Mouth Disease (19,836 animals), Glanders and Farcy, Pleuro-pneumonia, Rabies, Sheep-pox; Sheep-scab, Swine Erysipelas, Tuberculosis.

Sweden (month of October).

Anthrax, Blackleg, Swine-fever, Foot-and-Mouth Disease (3 "étables").

Switzerland (for the period November 13th—19th).

Anthrax, Blackleg, Swine Erysipelas, Foot-and-Mouth Disease (252 "étables" and 2 "alpages-pâturages" entailing 1,215 animals, of which 30 "étables" were declared during the period).

The Board of Agriculture and Fisheries have been furnished by the Board of Trade with the following report, based on returns from correspondents in various districts, on the demand for agricultural labour in November:—

Agricultural Labour in England during November.

Labourers outside the regular farm staff were chiefly required for harvesting the root crops, potato-lifting, threshing, hedging, and ditching. The partial failure of the root crops, and the forward state of farm work generally were the cause of a reduced demand for such men in most districts, and in a number of districts a surplus in the supply was reported. The loss of a little time by extra men, particularly threshers, on account of rain, was reported in many parts of the country.

Northern Counties.—There was only a moderate demand on the whole for extra labourers in these counties. Rain interfered with outdoor work in a number of districts, and employment was also adversely affected by the partial failure of the root crops. Some surplus of extra men was reported in *Cumberland,* the Clitheroe Rural District in *Lancashire,* and the Pickering, Sherburn, and Wetherby Rural Districts in *Yorkshire.* No change in the wages of farm servants was reported at the November hiring fairs in *Northumberland* and *Durham.* Correspondents in *Cumberland* and *Westmorland* reported a downward movement in wages at the Martinmas hirings, on account of the forward state of farm work, the reductions varying from about £1 to £2 for the half-year. Wages were also reported as slightly lower in *Lancashire.* At the *Yorkshire* hirings there was on the whole little change in wages, with, however, a slightly downward tendency.

Midland Counties.—Extra labourers were chiefly required for getting up the root crops and potatoes, threshing, hedging, and ditching. Rain caused some little loss of time in certain districts, and in many cases there was a restricted demand for extra men on account of the poor root crops. The supply of such men was quite sufficient, and there was some surplus in several districts, including the Chesterfield (*Derbyshire*), Tamworth (*Staffordshire*), Upton-on-Severn and Pershore (*Worcestershire*), Banbury and Crowmarsh (*Oxfordshire*), and Watford (*Hertfordshire*) Rural Districts.

Eastern Counties.—Harvesting the root crops, threshing, hedging, and ditching provided a fair amount of employment in many districts for extra labourers. The supply of and demand for men were generally about equal, but in some districts, particularly in *Norfolk* and *Suffolk,* extra men were in somewhat irregular work on account of the failure of the root crops.

Southern and South-Western Counties.—Rain caused some loss of time to extra labourers in *Kent, Surrey,* and *Sussex,* while elsewhere in this group of counties, apart from an occasional interruption to threshing, employment was not generally affected by the weather. The demand for extra men was, however, generally speaking, reduced by the forward state of farm work, and some surplus of men was reported in certain districts in *Hampshire,* and in the Faversham (*Kent*), the Wincanton (*Somerset*), Cirencester (*Gloucestershire*), South Molton

(*Devon*), and Liskeard (*Cornwall*) Rural Districts. A demand for men for tending cattle was reported from the Chippenham (*Wilts*) and Kingsbridge (*Devon*) Rural Districts.

THE CORN MARKETS IN NOVEMBER.

C. KAINS-JACKSON.

After a busy October, November is almost always dull, though on the present occasion it has been perhaps a little less dull than usual. The only staple in the price of which any large modification has occurred is linseed. Of this crop Argentina is expected to have a record yield in January, while the promise of the Indian crop to be reaped in April is also above an average. Putting these two probabilities together, sellers have decided that to tempt business very substantial concessions must be made. The great importance of linseed cake to all who have stock to fatten makes this change in the market for the raw material worth recording.

Wheat.—The price of English has averaged slightly more than in October and September. The total deliveries since September 1st have been 30 to 40 per cent. larger than in the previous two years, but as November wore on the excess became much less noticeable, and we have entered on December with the supply at the local markets not more than an average. The mean value clings closely to 33*s.* per 480 lb.

Imported wheat is nowadays a deeply divided market, the strong sorts, like fine Canadian and American, good Russian, and the best Argentine having their own special buyers, while Australian, Californian, and ordinary Indian and Argentine, are looked up by average purchasers, and inferior Canadian, Russian, and Turkish by those who need the wheat for feeding purposes or for the preparation of certain proprietary articles. Poultry-keepers who find "nothing like wheat" for egg production are rejoicing at the large Canadian consignments of No. 5, No. 6, and feeding Manitoba, which at 34*s.* to 39*s.* per 480 lb., are a decided relief to what had been a very stringent market. Really strong wheat of good quality makes 40*s.* to 41*s.* per qr., good but less special 38*s.* to 39*s.* per qr. Australian has made 37*s.* 6*d.* to 38*s.*, and La Plata 37*s.* to 37*s.* 6*d.*, while Indian has ranged between 35*s.* and 36*s.* for the majority of sorts submitted. New Zealand fetches about 36*s.* for long-berried, and 35*s.* for short-berried. Imports have been somewhat smaller than last season for the period September 1st to November 30th, but the increased supplies from British farmers have prevented there being any dearth of ordinary grades. There were on the 30th 2,640,000 qr. on passage, a total differing in no important degree from the average. Shipments for November were 1,150,000 qr. from North America (including good consignments from Canada); 177,000 qr. from South America; 1,158,000 qr. from Russia; 671,000 qr. from Europe S.E; 417,000 qr. from Australasia; and 246,000 qr. from India. The shipments from Australasia were heavy for the time of year, while with respect to those from Russia the reverse was the case.

Flour.—The average price of Town Household flour has been 26*s.* cash ex mill, against 27*s.* 3*d.* in November, 1910. The difference has not been enough to affect bread prices as a rule. Country Straights

are about 1*s.* lower on the year, 23*s.* 6*d.*, against 24*s.* 6*d.*; but stone-made flour keeps up well in price, and Standard—*i.e.*, 80 per cent. type—is 6*d.* dearer on the month. There is a good sale of fine American wheat ground in the best London mills. This flour is very steady at 28*s.* 6*d.* for cash. American flour has had a wide range, 23*s.* 9*d.* to 24*s.* being accepted for first bakers' type, and 31*s.* 6*d.* paid for fancy north-western spring. A good sample of north-western, such as Pillsbury's Best, can be had for 30*s.* per sack. Canadian best may be put at this level, with 28*s.* 9*d.* to 29*s.* paid for Manitoba straights. The prices of Canadian for January shipment are lower than the spot values. Argentina is promising to ship a good deal of flour in 1912. The best price asked is 27*s.*, and the poorer types come at 23*s.* per sack. The market for Australian has been poor, but there has been some rally in Hungarian, and in Roumanian a fair business, at 32*s.* to 34*s.* per sack, has passed. There were on the 30th 230,000 sacks, a very ordinary quantity, on passage. November shipments were 519,000 sacks from North America.

Barley.—Great firmness has continued to characterise this branch of the market, and some very high averages have been recorded for British markets. There is a rise in the mean value for the month. Californian, on arrival, has been promptly absorbed, and to-day only 35,000 qr. are on passage, while the spot offerings are practically *nil*. Prices naturally favour holders. Some 70,000 qr. of barley are on passage from Mediterranean ports, and will be found serviceable. Russian barley on passage amounts to 315,000 qr., and after a month of almost daily fluctuations, closed well on the holders' side of 6*s.* per cental. A good demand for Indian at 25*s.* to 25*s.* 6*d.* per 400 lb. exists, and the market could take a greatly increased supply of a cereal for which large areas in India are well fitted.

The barley shipments of November were 35,000 qr. from North America; 2,038,000 qr. from Russia; 469,000 qr. from Roumania and Bulgaria; 50,000 qr. from India and Persia; and 5,000 qr. from Spain. The last item is an interesting revival in a very old source of barley supply. There are now 475,000 qr. on passage altogether. This is not a large aggregate, though, as we have seen, the Russian contribution is large.

Oats.—Canada sent off in November 25,000 qr. only. Our market is paying a full guinea for 320 lb., and could take an indefinitely increased supply. The "Canada Year Book," recently published, shows that the average price on the farm for 1910 was only 12*s.* 7*d.* per qr., so that an excellent margin for trade should exist. South America shipped 165,000 qr., mainly very poor stuff of thick husk and about 288 lb. in natural weight. These oats are being sold at our ports for 17*s.* to 18*s.*, the weight being made up to 304 lb.

Russia has shipped 845,000 qr. and Europe S.E. 326,000 qr.; the Roumanian and Bulgarian on arrival are sold for 17*s.* per 304 lb., the Russian often being held for 18*s.* The supply of heavy oats, 320 to 336 lb., being in effect confined to farmers' deliveries, the month's average has shown a shilling rise even where markets have been continuously reported as dull. The quantity on passage is about 250,000 qr., and includes far too great a proportion of the poorest qualities.

Maize.—The ruling quotation has been 5*s.* 8*d.* per cental (27*s.* 3*d.* per 480 lb.) for American new crop delivered for cash at any British western port (5*s.* 9*d.* at an east coast port) during any month of 1912 from January to May. This price has dominated all immediate spot transactions, for which an average quotation of 30*s.* per qr. irrespective of shape or colour, round or flat, white or yellow, would be very little out. The fine small round maize, called Cinquantina, suits birds for which other sorts are too large. It commands in consequence 3*s.* to 4*s.* per qr. (in retail 6*d.* per bushel) more than the other kinds.

Maize shipments during November were 121,000 qr. from the United States; 131,000 qr. from Russia; and 276,000 qr. from Europe S.E. The quantity on passage on the 30th was 330,000 qr., against 930,000 qr. a year previously. The United Kingdom imports since September 1st have been much below the average.

Oilseeds.—Reference has already been made to the important reduction in linseed quotations. On the 30th Argentina was offering to ship in January at 53*s.* per 416 lb., and India was willing to ship in April at the same price per 410 lb. November shipments, 77,000 qr. from India and 126,000 qr. from Argentina, were much below the average, but represent, of course, old crop consignments only. Egyptian new crop cottonseed is now on our markets, but £8 10*s.* per ton is a price not very attractive to buyers.

Various.—Beet-sugar has fluctuated between 16*s.* and 17*s.* per cwt. The yield on the continent this autumn is much below that of last year. Rice has lost 1*d.* to 2*d.* per cwt. in spot value, but is still comparatively dear. Owing to the fine quality of this year's home growth of beans, peas, tares, and rye, prices have been stiffly supported despite slow markets. Russian buckwheat has declined 4*s.* on the month, 26*s.* per 416 lb. being now accepted. Haricots remain very dear. The writer noticed Indian chick peas offered on the 29th at 28*s.* 6*d.* per qr., or 1*s.* 6*d.* under the price previously given, but on inquiry found that the quarter was 480 lb. only, whereas the natural weight is usually 504 lb., and sales have hitherto nearly always been made by a quarter of that weight; 28*s.* 6*d.* per 480 lb. is practically 30*s.* per 504 lb.

THE LIVE AND DEAD MEAT TRADE IN NOVEMBER.

A. T. MATTHEWS.

Fat Cattle.—The general condition of the cattle on offer during November can scarcely be said to have improved, though, here and there, a few stall-fed animals began to appear. The supplies of half-meated bullocks have formed the leading feature at most markets, and the unusual difference of 1*s.* per stone between first and second quality has told its own tale. Trade, however, has maintained a healthy tone, prices have gradually hardened, and are now about 2*d.* per stone better than those of last year at this time. The fact that

at Ipswich, where there have been fair supplies of ripe Shorthorns from the stalls, butchers have been willing to give 9*s.* 6*d.*, and even 10*s.* per stone for weeks together, while the top price at other markets has been 8*s.* 9*d.*, is very significant, seeming to show that even costly artificial feeding has been well repaid. The following are the averages in twenty English markets for the first four weeks in November:—Shorthorns, 8*s.* 5*d.*, 7*s.* 5*d.*, and 6*s.* 3*d.*, against 8*s.* 3*d.*, 7*s.* 3¾*d.*, and 6*s* 2¼*d.* in October; Herefords, 8*s.* 7½*d.* and 7*s.* 8*d.*, against 8*s.* 5½*d.* and 7*s.* 9¼*d.*; Devons, 8*s.* 7½*d.* and 7*s.* 7½*d.*, against 8*s.* 5¼*d.* and 7*s.* 5½*d.*; Welsh Runts, 8*s.* 3*d.* and 7*s.* 6*d.*, against 8*s.* 1¾*d.* and 7*s.* 3¼*d.*; and Polled Scots, 8*s.* 7*d.* and 7*s.* 9¼*d.*, against 8*s.* 5¼*d.* and 7*s.* 8½*d.* per stone. Thus it may be said that English beef has advanced 2d. per stone during the month. Trade was very good in Scotland, and prices a little higher than in England, Shorthorns fetching frequently 40*s.* per cwt., and Scots up to 43*s.* 4*d.* by live weight.

Veal Calves.—The fat calf trade remained in a rather lifeless condition, veal being in only small demand. Although different markets have varied from 7¼*d.* to 9*d.* per lb. for first quality, yet the averages have worked out every week at 8*d.* and 7*d.* in all British markets.

Fat Sheep.—The chief feature in the fat sheep trade was the large number of tegs coming out three months before their proper time, forced sales having to be made through the terrible scarcity of winter keep. Islington market has been full of young sheep that would, in ordinary seasons, be kept till March. These have made from 35*s.* to 42*s.* each, many of them being from Norfolk and some from Oxfordshire. Hampshire tegs were also fairly supplied, but this is their normal season. The trade was dull and dragging, yet prices, though very low, were better than in October by ¼*d.* per lb. The average in English markets for the month was 7¾*d.*, 6¾*d.*, and 5¼*d.* for the three classes of Downs, and 7¼*d.*, 6¼*d.*, and 5*d.* per lb. for Longwools.

In a long journey through a turnip and sheep district the writer only saw two or three fields of swedes worth the cost of pitting, and it seems plain that the weight of mutton that can be produced in southern England this winter must be the smallest for many years. The prospect is therefore a gloomy one for producers and consumers of English mutton. Prices must, to all appearance, be very high in the spring. Next season's clip of wool must also be affected by the present premature sales.

Fat Pigs.—The value of bacon pigs has continued its downward course, giving way, on the average of thirty British markets, from ½*d.* to 1*d.* per stone per week. Prime small pigs averaged 6*s.* 2¼*d.* and larger weights 5*s.* 7*d.* per stone. Last year at this time the average stood at 7*s.* 4*d.* and 6*s.* 9*d.*

Carcass Beef—British.—Home-grown beef has just about followed the course of the live-stock markets with a quiet trade and little fluctuation. Scotch short sides in Smithfield Market fetched an average of 7¼*d.* and 7*d.* for first and second quality, long sides 6⅝*d.* and 6½*d.*, and English 5¾*d.* to 6*d.* per lb.

Port-Killed Beef.—American beef slaughtered at Deptford was in moderate supply, and sold freely at an average for the month of 6*d.* per lb. for first and [illegible] for second quality. The supply of "Rancher" beef was not large, and the best of it made about 5*d.* per lb.

Chilled Beef.—There was scarcely any States chilled on the market, but there were the usual heavy supplies of Argentine. The colder weather helped the trade, and there was a slight average advance established in hindquarters, and a much greater one in forequarters, which last stood, during October, at an absurdly low level. Hinds in November made 4⅜*d.* per lb. for the best, and 3⅝*d.* for second quality, while fores averaged 2½*d.* and 2¾*d.*, which was nearly double the October prices.

Frozen Beef.—This class of beef was again much neglected, as it usually is when chilled is at its present low figure. Hindquarters have averaged 3*d.* to 3½*d.* per lb., according to quality, but forequarters have fetched nearly as much as chilled.

Carcass Mutton—Fresh-Killed.—Scotch mutton sold during the first three weeks at 6½*d.* to 7*d.* per lb., but an advance of fully ¼*d.* then took place, and a good many choice Half-breds fetched 7½*d.* English was very slow, and the best West Country tegs never exceeded 6¾*d.* per lb. Dutch sold relatively well, and made 5½*d.* to 6*d.* per lb.

Frozen Mutton and Lamb.—The best "Canterbury" mutton sold at 4¼*d.* to 3¾*d.* per lb., but this does not include ewe carcasses. Argentine and Australian were about ½*d.* per lb. below New Zealand. New Zealand lamb was cheaper on the month, fetching 5¼*d.* as the top price. Some new season Argentine made 5*d.* per lb.

Veal.—The trade was irregular. Prime English was extremely scarce, and sometimes could not be quoted. Second quality made from 6½*d.* to 7½*d.* per lb., according to supply.

Pork.—Supplies were large, both of English and Dutch, and the former averaged 6¼*d.* for prime small and 5¾*d.* for larger pigs. Dutch fetched about ¼*d.* per lb. less money.

THE PROVISION TRADE IN NOVEMBER.

HEDLEY STEVENS.

Bacon.—Following the general reduction in prices during the month of October, values were advanced several shillings per cwt. early in November, which again checked the demand, and all markets suffered. A slump took place in some descriptions, especially in the case of long sides, best selections of which were offered at the end of the month at from 48*s.* to 52*s.* These are lower prices than for some years past. It is considered likely that these low figures will last for a few weeks at least, as the killings in Denmark for the second half of the month were roughly 100,000 pigs, which means that about 200,000 long sides will be placed on the English markets for sale during, say, two weeks of December. The killings in Ireland were large, resulting in Irish bacon being very cheap.

The shipments from America to this country were also heavier, and as the American hogs are still being marketed freely, the immediate outlook is for a continued lower range of prices on the other side of the Atlantic. The value of hogs at Chicago during the month ranged from $5.40 to $6.60, against $6.60 to $8.50 during the same period of last year, and $7.25 to $8.45 two years ago. Meanwhile the demand for American and Canadian bacon on the British markets was again

very small; in fact, some cuts of American were practically unsaleable, so causing an accumulation of stock, this tending still further to keep prices down, probably until the end of the year.

The English curers still report that they are able to obtain all the pigs they want, and as breeders continue to be anxious to reduce their holdings, the view is generally expressed that we shall see much higher prices around April next, when in most pig-rearing countries the effect of killing off the young stock will be seriously felt.

Cheese.—The demand throughout the month was not large, and prices showed little change, although perhaps on the whole they were a little firmer. Best Canadians made 69*s.* to 71*s.* Advices from Canada confirmed the shortage in the make in that country, and cables demanded from 68*s.* to 70*s.* for best "fall-makes," but there was not much business transacted, importers being afraid to operate at such prices, with each of the steamers from New Zealand bringing moderate shipments from that country. The quality of this latter cheese is reported to be very satisfactory for so early in the season, and prices ranged from 68*s.* to 69*s.*

The present high prices of Canadian and New Zealand—in the case of the former say 15*s.*, and the latter 12*s.* per cwt. over those current at the same time last year—is bound to curtail the consumption of cheese during the winter, but it is maintained by those best able to judge that with the big shortage in the home make, even with the decreased consumption, all the cheese will be wanted before the new season opens.

At the end of the month the estimated stock of Canadian cheese at the three principal distributing centres (London, Liverpool, and Bristol) was 314,000 cheese, against 428,000 at the same time last year, and 419,000 two years ago.

English cheese was in fair demand at advanced prices, but the extremely high prices prevented any freedom in business. On account of the great shortage of stocks, holders were independent sellers, even at the abnormal prices current.

Butter.—The reduction in prices reported during the previous month did not continue, and with the stored stocks of the merchants much decreased, as well as a better consumptive demand, prices again advanced several shillings. The arrivals from Australia and New Zealand were more free by the end of the month, but found ready buyers at full prices, especially the best grades. Although the Australian season was backward, the shipments to date are about equal to those for the same period of last year. Arrivals from Denmark were below average, but it is expected that they will soon increase.

Canada has now practically stopped shipping, and there is very little coming from America, as the prices in both countries are out of competition with those ruling here for Australian and New Zealand. In America equal to 143*s.* c.i.f. is being made freely for creameries.

Eggs.—Eggs retained their high range of prices, which curtailed the consumption. English were again very scarce.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of November, 1911.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	England.		Scotland.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK:—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle:—	s. d.	s. d.	s. d.	s. d.
Polled Scots	8 6	7 10	41 2	37 2
Herefords	8 7	7 9	—	—
Shorthorns	8 5	7 5	39 10	36 3
Devons	8 8	7 9	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	8	7¼	8½	7
Sheep:—				
Downs	7¾	6¾	—	—
Longwools	7¼	6¼	—	—
Cheviots	8	7¼	7¾	6¾
Blackfaced	7½	6½	7	6¼
Cross-breds	7¾	6¾	8	6¾
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs:—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	6 2	5 8	5 11	5 4
Porkers	7 0	6 6	6 6	5 10
LEAN STOCK:—	per head.	per head.	per head.	per head.
Milking Cows:—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	22 6	18 3	23 13	18 9
,, —Calvers... ...	21 4	17 17	19 5	17 12
Other Breeds—In Milk ...	18 14	15 17	19 19	16 6
,, —Calvers ...	14 5	12 2	19 11	16 6
Calves for Rearing	2 1	1 10	2 13	1 14
Store Cattle:—				
Shorthorns—Yearlings ...	9 6	7 15	10 9	8 17
,, —Two-year-olds...	12 17	11 2	14 7	12 8
,, —Three-year-olds	16 15	14 17	16 16	—
Polled Scots—Two-year-olds	—	—	14 15	13 6
Herefords— ,,	14 11	13 2	—	—
Devons— ,,	12 19	11 3	—	—
Store Sheep:—				
Hoggs, Hoggets, Tegs, and Lambs—	s. d.	s. d.	s. d.	s. d.
Downs or Longwools ...	30 3	23 11	—	—
Scotch Cross-breds ...	—	—	26 10	20 7
Store Pigs:—				
8 to 10 weeks old	13 6	9 6	15 4	11 6
12 to 16 weeks old	23 1	16 7	—	—

* Estimated carcass weight.

† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of November, 1911.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	Quality.	Birmingham.	Liverpool.	London.	Manchester.	Edinburgh.	Glasgow.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF:—							
English	1st	56 0	50 6	56 6	49 6	57 0*	58 0*
	2nd	50 6	46 0	53 6	46 0	50 6*	51 6*
Cow and Bull ...	1st	45 6	43 6	45 6	43 6	46 0	46 0
	2nd	41 0	37 6	40 6	38 6	38 0	40 6
U.S.A. and Canadian:—							
Port Killed ...	1st	53 6	51 6	56 0	—	—	51 6
	2nd	46 6	46 0	52 6	46 6	—	49 0
Argentine Frozen—							
Hind Quarters...	1st	32 6	31 6	33 0	31 6	32 0	31 6
Fore ,, ...	1st	23 0	23 0	23 0	22 0	21 6	21 6
Argentine Chilled—							
Hind Quarters...	1st	37 6	36 6	38 6	36 6	39 0	38 0
Fore ,, ...	1st	24 6	23 6	24 0	23 6	24 6	25 6
Australian Frozen—							
Hind Quarters.	1st	32 6	31 6	33 0	31 6	—	30 0
Fore ,, ...	1st	23 6	20 0	23 0	20 0	—	20 0
VEAL:—							
British	1st	61 6	71 6	70 0	70 0	—	66 6
	2nd	52 6	65 6	63 6	65 6	—	65 6
Foreign	1st	—	—	71 6	—	75 0	—
MUTTON:—							
Scotch	1st	63 0	65 0	66 0	64 6	60 6	67 6
	2nd	—	59 6	61 6	61 0	52 0	48 6
English	1st	58 6	60 0	59 0	61 0	—	—
	2nd	—	54 6	52 6	56 0	—	—
Argentine Frozen ...	1st	33 6	33 0	34 0	33 0	32 6	33 0
Australian ,, ..	1st	31 6	31 0	31 6	31 0	—	30 6
New Zealand ,, ...	1st	—	—	39 0	—	—	—
LAMB:—							
British	1st	—	—	—	—	—	—
	2nd	—	—	—	—	—	—
New Zealand ...	1st	51 6	46 0	49 6	46 6	—	46 6
Australian	1st	43 6	40 0	44 6	40 0	—	39 6
Argentine	1st	41 6	38 6	45 0	38 6	—	39 6
PORK:—							
British	1st	63 0	64 0	58 0	63 0	55 6	54 6
	2nd	56 6	59 6	53 0	58 0	46 0	50 0
Foreign	1st	—	—	55 0	—	—	—

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1909, 1910 and 1911.

Weeks ended (*in* 1911).	WHEAT.						BARLEY.						OATS.					
	1909.		1910.		1911.		1909.		1910.		1911.		1909.		1910.		1911.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
Jan. 7 …	32	9	33	6	30	5	26	11	24	11	23	11	17	5	17	2	17	0
,, 14 …	32	8	33	8	30	8	27	1	24	11	23	10	17	5	17	7	17	2
,, 21 …	33	2	33	9	30	11	27	3	24	11	24	4	17	8	17	6	17	4
,, 28 …	33	0	33	6	30	11	27	6	25	0	24	5	17	9	17	4	17	3
Feb. 4 …	33	4	33	7	30	9	27	7	24	10	24	5	17	10	17	7	17	5
,, 11 …	33	8	33	4	30	5	27	8	24	9	24	6	17	11	17	11	17	5
,, 18 …	34	1	33	0	30	3	27	11	24	6	24	7	18	0	18	0	17	6
,, 25 …	34	5	32	7	30	2	28	0	24	2	24	9	18	0	17	10	17	7
Mar. 4 …	34	10	32	7	30	0	27	11	24	6	25	0	18	2	18	1	17	5
,, 11 …	35	8	32	6	30	1	28	4	24	1	25	0	18	2	18	0	17	5
,, 18 …	35	9	32	6	30	1	28	0	23	6	24	11	18	5	18	0	17	6
,, 25 …	36	0	32	9	30	2	28	0	23	7	25	0	18	6	17	11	17	5
Apl. 1 …	36	5	33	0	30	3	27	10	23	8	24	11	18	8	18	0	17	5
,, 8 …	37	4	33	6	30	4	28	0	23	1	24	7	18	10	17	11	17	7
,, 15 …	38	7	33	7	30	3	27	8	23	5	25	2	19	2	18	3	18	3
,, 22 …	41	4	33	7	30	4	28	2	23	0	25	5	19	9	18	3	17	10
,, 29 …	42	5	33	0	30	11	27	10	22	10	25	5	20	0	18	3	18	3
May 6 …	40	9	32	6	31	4	27	7	22	7	25	7	20	3	18	2	18	6
,, 13 …	41	6	32	1	31	8	27	3	22	0	25	1	20	6	18	1	19	0
,, 20 …	42	8	31	10	32	6	27	0	21	8	25	4	20	11	17	8	19	2
,, 27 …	42	6	31	3	32	8	26	3	21	4	25	0	21	0	17	10	19	5
June 3 …	43	1	30	2	32	5	25	7	21	8	24	10	21	3	17	10	19	5
,, 10 …	42	11	29	1	32	4	26	10	20	9	25	7	21	4	17	10	19	7
,, 17 …	42	7	29	0	32	3	26	10	18	11	23	11	21	6	18	0	19	8
,, 24 …	42	8	29	4	31	11	27	2	20	1	23	9	21	7	17	9	19	10
July 1 …	42	9	29	9	31	10	27	2	19	11	24	5	21	9	17	7	19	9
,, 8 …	43	0	30	4	32	1	26	4	19	5	25	10	21	8	17	4	19	9
,, 15 …	43	3	31	1	32	3	26	10	21	3	25	10	21	9	17	7	19	11
,, 22 …	44	0	31	11	32	5	27	4	19	9	24	3	22	5	17	5	19	5
,, 29 …	43	5	33	5	32	5	24	6	20	10	23	8	22	2	18	1	19	7
Aug. 5 …	44	9	33	9	32	0	27	4	20	5	24	4	22	11	18	3	18	2
,, 12 …	44	9	33	5	31	6	24	9	20	4	26	9	21	8	18	0	18	0
,, 19 …	41	6	32	11	31	6	23	11	20	11	27	8	19	8	17	11	17	10
,, 26 …	38	5	32	7	31	8	24	7	20	10	28	10	19	4	17	2	18	0
Sept. 2 …	37	2	32	2	31	7	26	3	22	10	28	4	19	6	17	2	18	3
,, 9 …	34	11	31	11	31	10	26	1	23	3	28	4	18	5	17	2	18	1
,, 16 …	33	6	30	11	32	0	26	5	24	3	29	0	17	9	16	6	18	5
,, 23 …	32	9	30	2	32	4	26	8	24	2	29	11	17	7	16	3	18	9
,, 30 …	32	2	30	1	32	6	26	9	24	4	30	5	17	2	16	4	19	1
Oct. 7 …	31	8	30	1	32	7	26	9	24	7	30	9	17	0	16	3	19	5
,, 14 …	31	4	30	2	32	9	27	0	25	1	31	0	17	0	16	2	19	10
,, 21 …	31	8	30	4	32	9	27	7	25	3	31	5	16	11	16	1	19	11
,, 28 …	31	10	30	4	33	1	27	9	25	4	31	7	17	0	16	2	20	6
Nov. 4 …	32	5	30	4	33	4	27	9	25	6	31	10	17	0	16	2	20	8
,, 11 …	32	5	29	11	33	4	27	7	25	4	32	7	17	1	15	11	20	11
,, 18 …	32	7	29	8	33	1	27	0	25	1	32	10	17	4	16	1	21	0
,, 25 …	33	0	29	11	33	0	26	8	24	10	33	5	17	3	16	4	20	10
Dec. 2 …	33	3	30	6	32	10	26	1	24	7	33	10	17	4	16	7	20	11
,, 9 …	33	3	30	9	32	9	25	7	24	3	34	0	17	3	16	9	20	9
,, 16 …	33	2	30	7			25	3	23	9			17	4	16	10		
,, 23 …	33	1	30	7			25	2	23	10			17	4	16	9		
,, 30	33	3	30	5			25	1	23	9			17	4	16	9		

NOTE.—Returns of purchases by weight or weighed measure are converted to perial Bushels at the following rates: Wheat, 60 lb.; Barley, 50 lb.; Oats, lb. per Imperial Bushel.

AVERAGE PRICES of **Wheat, Barley,** and **Oats** per Imperial Quarter in FRANCE, BELGIUM, and GERMANY, and at PARIS, BERLIN, and BRESLAU.

—		Wheat. 1910.		Wheat. 1911.		Barley. 1910.		Barley. 1911.		Oats. 1910.		Oats. 1911.	
		s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
France:	October	46	4	43	0	25	7	27	7	21	0	21	11
	November	46	2	43	3	25	8	27	11	21	0	22	2
Paris:	October	48	10	43	7	25	5	26	10	21	6	22	8
	November	48	1	43	9	26	0	27	3	21	3	22	11
Belgium:	September	33	5	34	2	21	10	26	7	19	9	22	3
	October	33	7	34	1	22	6	27	7	18	11	22	4
Germany:	September	41	0	43	4	25	4	33	4	20	2	24	4
	October	40	11	43	3	26	8	34	4	20	9	25	0
Berlin:	September	43	6	44	2	—		—		20	9	25	4
	October	43	1	43	10	—		—		20	3	25	7
Breslau:	September	38	3	40	10	25 22	10* 11†	30 24	8* 9†	20	3	23	2
	October	38	5	40	4	25 22	9* 11†	30 25	10* 1†	20	7	23	7

* Brewing. † Other.

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the German quotations are taken from the *Deutscher Reichsanzeiger*, the prices for the German Empire representing the average of the prices at a number of markets.

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of November, 1910 and 1911.

—	Wheat. 1910.		Wheat. 1911.		Barley. 1910.		Barley. 1911.		Oats. 1910.		Oats. 1911.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
London..	31	2	34	4	25	5	34	7	17	4	21	8
Norwich	30	6	32	11	24	2	33	3	16	2	21	0
Peterborough	29	5	32	8	25	11	32	2	15	8	20	11
Lincoln...	29	5	33	2	25	3	32	5	16	4	21	6
Doncaster	29	8	32	11	23	7	31	9	15	11	21	1
Salisbury	29	9	32	3	23	3	32	3	16	1	20	9

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of November, 1911.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Bristol.		Liverpool.		London.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality	First Quality.	Second Quality.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British	16 0	15 0	—	—	17 0	15 3	16 0	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish Creamery	129 0	125 0	130 6	128 0	130 6	126 6	130 0	128 0
,, Factory	117 6	111 6	110 0	111 6	118 6	112 6	—	—
Danish ..	—	—	137 6	135 6	137 0	134 6	133 0	—
French ...	—	—	—	—	141 0	138 6	—	—
Russian	121 6	110 6	123 0	118 0	122 6	119 0	122 6	118 0
Canadian	126 6	122 6	124 0	121 6	121 0	120 0	124 0	—
Australian ...	134 0	130 0	132 6	130 0	132 6	128 0	131 6	129 6
CHEESE :—								
British—								
Cheddar ...	88 0	83 0	87 0	83 0	93 0	85 0	75 6	73 6
			120 lb.	120 lb.	120 lb.	120 lb.	120 lb.	120 lb.
Cheshire ..	—	—	85 6	79 0	95 0	82 6	92 0	88 0
			per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Canadian ..	70 0	68 6	70 0	68 0	71 0	69 6	70 0	—
BACON :—								
Irish	59 6	56 0	58 0	54 0	61 0	58 0	61 0	60 6
Canadian ...	56 6	54 0	54 0	52 0	55 6	53 6	56 0	54 0
HAMS :—								
Cumberland	—	—	—	—	110 6	100 6	—	—
Irish ..	—	—	—	—	112 0	106 0	80 0	74 0
American (long cut)	61 0	57 0	61 6	56 6	65 0	61 0	58 6	57 0
EGGS :—	per 120.	per 120	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British ...	19 2	16 3	—	—	20 2	18 1	—	—
Irish	16 5	15 7	15 10	14 6	17 0	15 0	16 10	15 1
Danish ...	—	—	15 11	14 10	17 10	16 5	16 11	16 5
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton	per ton.	per ton.	per ton.
Edward VII.	91 0	81 0	65 0	00 0	83 0	75 0	—	—
Langworthy ..	80 0	70 0	85 0	75 0	86 0	80 0	—	—
Up-to-Date ...	80 6	72 6	56 6	53 6	85 6	78 0	60 0	55 0
HAY :—								
Clover ...	110 0	100 0	118 0	91 6	122 0	100 0	85 0	80 0
Meadow ...	105 0	95 0	—	—	116 6	94 6	—	—

DISEASES OF ANIMALS ACTS, 1894 to 1910.

NUMBER OF OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

Disease.	November.		Eleven Months ended November.	
	1911.	1910.	1911.	1910.
Swine-Fever:—				
Outbreaks	151	146	2,232	1,360
Swine Slaughtered as diseased or exposed to infection ...	2,215	1,437	27,030	12,624
Anthrax:—				
Outbreaks*	86	112	809	1,318
Animals attacked	68	135	990	1,567
Foot-and-Mouth Disease:—				
Outbreaks	—		18	2
Animals attacked	—		467	15
Glanders (including Farcy):—				
Outbreaks . . .	15	13	192	330
Animals attacked	44	33	463	956
Sheep-Scab:—				
Outbreaks	38	38	354	399

* For 1910 the figures show the outbreaks reported, but for 1911 the outbreaks confirmed.

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

Disease.	November.		Eleven Months ended November.	
	1911.	1910.	1911.	1910.
Swine-Fever:—				
Outbreaks	30	8	143	86
Swine Slaughtered as diseased or exposed to infection ...	421	189	2,344	1,967
Anthrax:—				
Outbreaks	2	—	9	7
Animals attacked	2	2	14	12
Glanders (including Farcy):—				
Outbreaks	—	—	2	1
Animals attacked	—	—	3	2
Sheep-Scab:—				
Outbreaks	23	23	304	405

SELECTED CONTENTS OF PERIODICALS.

Agriculture, General and Miscellaneous—

Seaweed as a Manure. (*Dept. Agr. and Tech. Instr. Ireland Jour.*, October, 1911.) [B. 24–3.]

Untersuchungen über das Verhalten des Ammoniakstickstoffs in gekalkten und ungekalkten Böden, *O. Lemmermann* and ors. [B. 40–9.] Untersuchungen über die Zersetzung der Kohlenstoffverbindungen verschiedener organischer Substanzen im Boden, speziell unter dem Einfluss von Kalk, *O. Lemmermann* and ors. [B. 40–9.] (Landw. Jahrb., XLI. Band, Heft 2, 1911.)

Les ressources agricoles du Soudan anglo-égyptien, de l'Erythrée et de l'Abyssinie. (Rev. Gén. Agron., Mai et Août, 1911.) [A. 72.]

Le développement agricole de la Belgique depuis 1830. (Etudes d'Économie Rurale, par *E. Vliebergh*.) [A. 25.]

Peat Moss Litter Manure. (*Kew Bulletin*, No. 8, 1911.) [B. 24–3; B. 56.]

Revue de Microbiologie Agricole, *M. Kayser*. (Bul. Mens. Off. Renseig. Agr. [Paris], Septembre, 1911.) [B. 42.]

The experimental error of field trials, *W. B. Mercer* and *A. D. Hall*. [B. 46.] The formation of calcium carbonate in the soil by bacteria, *C. T. Gimingham*. [B. 40–9.] Soil surveys and soil analyses, *A. D. Hall* and *E. J. Russell*. [B. 40–5.] (Jour. Agr. Sci., Vol. IV., Part 2, October, 1911.)

Versuche über den Verbleib des Gründüngungstickstoffs auf einem Sandboden, *Dr. von Seelhorst*. (Mitt. Deut. Landw. Gesell., 4 November, 1911.) [B. 28–5.]

Bacteriological Tests in Soil and Dung, *W. A. Millard*. (Centbl. Bakt. etc.) 2e Abt., 31 Band, No. 16–22, November, 1911.) [B. 40–3; B. 24–3.]

Field Crops—

Versuche mit den neuen Getreidekulturverfahren nach *Demtschinsky* und *Zehetmayr* auf den Versuchsfeldern der Kgl. Württ. Landw. Hochschule in Hohenheim, *Dr Wacker*. [C. 22–1.] Zusammenstellung der Versuchsergebnisse des Kulturfahrens nach *Demtschinsky* und seiner Abänderung nach *Zehetmayr* und anderen, unter Benutzung der dem Institut für Versuchswesen und Bakteriologie zur Berichterstattung vom Königlichen Ministerium übergebenen Berichte der Preussischen Landwirtschaftskammern, *Dr. A. Einecke*. [C. 22–1.] (Landw. Jahrb., XLI. Band, Heft 2, 1911.)

Plant Diseases—

Report on Investigations made regarding "Beech Coccus" (*Cryptococcus fagi*), *L. A. Boodle* and *W. Dallimore*. (Kew Bulletin, No. 8, 1911.) [E. 40–51.]

"Silver-leaf" disease, *F. T. Brooks*. (Jour. Agr. Sci., Vol. IV., Part 2, October, 1911.) [E. 60–11.]

Die Bekämpfung des Flugbrandes von Weizen und Gerste, *Dr. O. Appel* und *Dr. E. Riehm*. (Arb. K. Biol. Anst. Land. u. Forstw., 8 Band, Heft 3, 1911.) [E. 60–19.]

Injurious Insects and other Animals observed in Ireland during the year 1910, *G. H. Carpenter*. [E. 2.] Experiments carried out at the Albert Agricultural Institution, Glasnevin: An Inquiry into the Potato Disease, *Phytophthora infestans*, *T. Carroll*. [E. 60–37.] (Econ. Proc. Roy. Dublin Soc., Vol. II., Nos. 3 and 4, September, 1911.)

Observations on *Marasmius oreades* and *Clitocybe gigantea*, as Parasitic Fungi causing "Fairy Rings," *Jessie S. Bayliss*. (Jour. Econ. Biol., Vol. 6, No. 4, October, 1911.) [E. 60–7.]

ADDITIONS TO THE LIBRARY.

Agriculture, General and Miscellaneous—

Schmidt, Dr. Heinrich.—Wörterbuch der Biologie. (581 pp.) Leipzig: Alfred Kröner, 1912. [Received in 1911.] *12s.* [B. 6; K. 2.]

Tansley, A. G. (edit.).—Types of British Vegetation: By Members of the Central Committee for the Survey and Study of British Vegetation. (416 pp.) Cambridge: University Press, 1911. *6s.* net. [B. 16–3.]

Sargant, Ethel.—A Theory of the Origin of Monocotyledons, founded on the Structure of their Seedlings. (92 pp+vii. plates.) [Annals of Botany, Vol. XVII., No. LXV., January, 1903.] [B. 18.]

Indian Forest Memoirs, Forest Botany Series.—Vol. I., Part I.:—On some Indian Forest Grasses and their Oecology. (126 pp.+xl. plates.) Calcutta: Superintendent Government Printing, 1911. *8s. 6d.* [B. 16–1; L. 8.]

Royal Commission on University Education in London.—Appendix to Third Report of the Commissioners. Minutes of Evidence, November, 1910–July, 1911, with Appendices and Index. [Cd. 5911.] (489 pp.) London: Wyman & Sons, 1911. *4s.* [B. 44–5.]

Baur, Dr. Erwin.—Einführung in die experimentelle Vererbungslehre. (293 pp.+ix. plates.) Berlin: Gebrüder Borntraeger, 1911. [B. 17.]

Crampton, C. B.—The Vegetation of Caithness considered in relation to the Geology. (132 pp.) Published under the auspices of the Committee for the Survey and Study of British Vegetation, 1911. [B. 16–5; B. 36.]

New South Wales, Dept. of Agriculture.—Farmers' Bull. No. 16:—Manures and Manuring. [Third edition.] (46 pp.) Sydney, 1911. [B. 24–1.]

Kerner, Anton.—The Natural History of Plants: Their Forms, Growth, Reproduction, and Distribution. Translated by *F. W. Oliver.** Vol. I., Biology and Configuration of Plants. (777 pp.) Vol. II., The History of Plants. (983 pp.) London: Blackie & Son, 1902. *30s.* net (2 vols.). [B. 16–1.]

Colorado Agricultural Experiment Station.—Bull. No. 178:—The Fixation of Nitrogen in some Colorado Soils. (96 pp.) [B. 28–5.] Bull. No. 179:—Bacteriological Studies of the Fixation of Nitrogen in Certain Colorado Soils. (42 pp.) [B. 28–5.] Fort Collins, Colorado, 1911.

Forestry—

Salisch, H. von.—Forstästhetik [Dritte, vermehrte Auflage]. (434 pp.) Berlin: Julius Springer, 1911. [L. 20–1.]

U.S. Dept. of Agriculture, Forest Service.—Circ. No. 185:—"Columbian Mahogany" (*Cariniana pyriformis*): Its Characteristics and its use as a Substitute for True Mahogany (*Swietenia mahagoni*). (16 pp.) [L. 26–15.] Bull. No. 75:—California Tanbark Oak. Part I.—Tanbark Oak and the Tanning Industry. Part II.—Utilisation of the Wood of Tanbark Oak. Appendix.—Distribution of Tannin in Tanbark Oak. (34 pp. + 10 plates.) [L. 20–15; L. 30.] Bull. No. 85:—Chapparal. Studies in the Dwarf Forests, or Elfin-wood, of Southern California. (48 pp. + map.) [L. 12; L. 20–15.] Bull. No. 90:—Relation of Light Chipping to the Commercial Yield of Naval Stores. (36 pp.) [L. 30.] [A report of experiments on tapping trees for turpentine.] Bull. No. 91:—Grazing and Floods: a Study of Conditions in the Manti National Forest, Utah. (16 pp. + 5 plates.) [L. 12; B. 56.] Bull. No. 92:—Light in Relation to Tree Growth. (59 pp.) [L. 20–3.] Bull. No. 94:—Scrub Pine (*Pinus virginiana*). (27 pp.) [L. 20–15.] Bull. No. 99:—Uses of the Commercial Woods of the United States. II. Pines. (96 pp.) [L. 28.] Washington, 1911.

Chancerel, Lucien.—L'Année Forestière (1910). Actualités de la Science des Forêts. (323 pp.) Paris: Berger-Levrault, 1911. 3 fr. 50. [L. 6; L. 20–1.]

Hanson, C. O.—Forestry for Woodmen. (222 pp.) Oxford: Clarendon Press, 1911. 5*s.* net. [L. 20–1.]

U.S. Dept. of Agriculture, Bureau of Plant Industry.—Circ. No. 82:—Crop Plants for Paper Making. (19 pp.) Washington, 1911. [L. 34.]

Nisbet, J.—The Elements of British Forestry: A Handbook for Forest Apprentices and Students of Forestry. (345 pp.) London: W. Blackwood and Sons, 1911. 5*s.* 6*d.* net. [L. 20–1.]

Schwappach, Dr. A.—Die Rotbuche. Wirtschaftliche und statische Untersuchungen der forstlichen Abteilung der Hauptstation des forstlichen Versuchswesens in Eberswalde. [Mitt. forstl. Versuchsw. Preussens.] (231 pp. and plates.) Neudamm: J. Neumann, 1911. [L. 4.]

New Zealand, Dept. of Lands.—Report on the Dune-areas of New Zealand, their Geology, Botany, and Reclamation. (76 pp. + plates.) Wellington, 1911. [L. 20–5; A. 98.]

Jepson, W. L.—The Silva of California. (480 pp. + 85 plates + 3 maps.) [Memoirs of the University of California, Volume 2.] London: T. Fisher Unwin, 1910. £2 2*s.* net. [L. 12.]

Krais, Dr. Paul (edit.).—Gewerbliche Materialkunde. Erster Band. Die Hölzer. (782 pp.) Stuttgart: Felix Krais, 1910. [L. 28.]

Wagner, Prof. C.—Die Grundlagen der räumlichen Ordnung im Walde. [Zweite vermehrte und verbesserte Auflage.] (368 pp.) Tübingen: H. Laupp'schen Buchhandlung, 1911. [L. 20–1.]

Engineering—

King, F. H.—Irrigation and Drainage. Principles and Practice of their Cultural Phases. [Seventh edition.] (502 pp.) New York: The Macmillan Co., 1911. 6*s.* 6*d.* net. [M. 8; M. 12.]

Deutsche Landwirtschafts-Gesellschaft.—Arbeiten. Heft 191:—Vorprüfung neuer milchwirtschaftlichen Geräte. (96 pp.) Berlin: Paul Parey, 1911. [M. 4–3.]

Wisconsin Agricultural Experiment Station.—Bull. No. 214:—Concrete Silo Construction. (31 pp.) Madison, Wisconsin, 1911. [M. 2.]

Missouri Agricultural Experiment Station.—Circ. No. 48:—The Plastered or Gurler Silo. (107–114 pp.) [M. 2.] Circ. No. 49:—The Reinforced Concrete Silo. (115–122 pp.) [M. 2.] Columbia, Missouri, 1911.

Bright, T.—The Agricultural Surveyor and Estate Agents' Handbook. [Second edition.] (448 pp.) London: Crosby Lockwood and Son, 1911. [M. 22.]

First Report of the Proceedings of the Road Board for the period from 13th May, 1910, to 30th June, 1911. (H.C. 292–1911.) (69 pp.) London: Wyman & Sons, 1911. 7*d.* [M. 14.]

U.S. Dept. of Agriculture, Office of Public Roads.—Bull. No. 36:—Descriptive Catalogue of the Road Model Exhibit. (20 pp. and plates.) [M. 14.] Bull. No. 37:—Examination and Classification of Rocks for Road Building, including the Physical Properties of Rocks with Reference to their Mineral Composition and Structure. (28 pp. + 10 plates.) [M. 14.] Bull. No. 39:—Highway Bridges and Culverts. (22 pp. and plates.) [M. 14.] Washington, 1911.

Ohio Agricultural Experiment Station.—Bull. No. 227:—A Study of Farm Equipment. (200–253 pp.) Wooster, Ohio, 1911. [M. 2; M. 4.] [A study of the equipment and distribution of investment in land, improvements, livestock, machinery and tools on a number of farms in the State of Ohio.]

New Mexico Agricultural Experiment Station.—Bull. No. 77:—Tests of Centrifugal Pumps. (81 pp.) Santa Fe, New Mexico, 1911. [M. 4.]

Economics—

Canada, Dept. of Labour.—Report on Wholesale Prices, Canada, 1910. (134 pp.) [N. 34–1.] Comparative Prices, Canada and the United States, 1906–1911 (Agricultural, Fisheries, Lumber and Mines Products). (316 pp.) [N. 34–1.] Ottawa, 1911.

Board of Trade.—Census of Production (1907). Preliminary Tables. Part IX. [Cd. 5813.] (102 pp.) London: Wyman and Sons, 1911. 10*d.* [Particulars relating to Building Trade, Gas, Electricity, and Waterworks Undertakings, &c., are given.]

Wisconsin Agricultural Experiment Station.—Bull. No. 209:—The Prices of Farm Products. (30 pp.) Madison, Wisconsin, 1911. [N. 34–1.]

Western Australia, Government Statistician.—Statistical View of Eighty-two Years Progress in Western Australia, 1829–1910. (19 pp.) Perth, 1911. [N. 44–21.]

Royaume de Hongrie, L'Office Central de Statistique.—Activité et Travaux de l'Office Central de Statistique du Royaume de Hongrie (1871–1911). (632 pp.) Budapest, 1911. [N. 44–9.]

Parsons, A., and Allen, R.—The Workmen's Compensation Act, 1906. (471 pp.) London: Butterworth & Co., 1910. 12*s.* 6*d.* net. [N. 22–5.]

Institut International d'Agriculture.—Études monographiques sur la coopération agricole dans quelques pays. Ier Volume. (457 pp.) Rome, 1911. 3 fr. 50. [N. 4–1.] [In the first three numbers of the "Bulletin of Economic and Social Intelligence," which appeared in 1910, were published monographs on agricultural organisation in nineteen countries. These issues having become out of print, these monographs have been issued in a revised and augmented form in two volumes.]

Institut International d'Agriculture.—L'organisation de la statistique de la coopération agricole dans quelques pays. Matériaux pour aider à l'unification de la statistique de la coopération agricole. (161 pp.) [N. 4–1; N. 44–1.] Rome, 1911.

Rhodesia, Dept. of Agriculture.—Leaflet No. 2:—The Formation of Agricultural Credit Associations in Rhodesia. (6 pp.) Salisbury, Rhodesia. 1911. [N. 6–5.]

Österreich, K. K. Statistische Zentralkommission.—Vorläufige Ergebnisse der Viehzählung vom 31 Dezember, 1910. (39 pp.) Wien, 1911. [N. 42; F. 28.]

Modona, Prof. Avv. L. Neppi.—Il bene di famiglia insequestrabile e la protezione della piccola proprietà rustica nella legislazione straniera ed italiana. (322 pp.) Firenze: Succi. B. Seeber, 1912. [N. 10–3; N. 14–7.] [*Contains bibliography, 20 pages.*]

Jackson, C. Kains.—The Metric System as Applied to Agriculture. (79–98 pp.) [Journal of the Farmers' Club, October, 1911.] [N. 38.]

Vliebergh, E.—Études d'Économie Rurale [chiefly relating to Belgium]. (365 pp.) Louvain: Bibliothèque Choisie, 1911. [N. 2–3; A. 25.]

Wateridge, F. W.—Prosperous Agriculture and Home Life. What it means to the Nation. (263 pp.) London: Swan, Sonnenschein & Co., 1911. 2*s.* 6*d.* net. [N. 2–3.]

Farrow, Thomas.—Banks and the People. (168 pp.) London: Chapman & Hall, 1911. 1*s.* net. [N. 6–1.]

U.S. Dept. of Agriculture, Bureau of Statistics.—Bull. No. 90:—Imports of Farm and Forest Products, 1908–1910, by Countries to which Consigned. (80 pp.) Washington, 1911. [N. 44–15.]

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PARTIAL STERILISATION OF SOIL FOR GLASSHOUSE WORK.

E. J. Russell, D.Sc., and F. R. Petherbridge, B.A.
Rothamsted Experimental Station.

Partial Sterilisation and What it Does.

The grower under glass, working against time and season, is compelled to make every condition as favourable as possible for his plants. He maintains by artificial means a proper temperature and water supply, he does his best to secure adequate light, and he uses such soils and manures as are best suited to the crops he is growing. He soon finds, however, that his particular crop is not the only thing his soil brings forth; the warmth, moisture and food that he so liberally supplies also encourage a host of other living things: woodlice, centipedes, millipedes, white worms, springtails, eelworms, and scores of fungi; and he may even have the mortification of finding that his own crop fares very badly through the activity of these parasites, the roots being invaded by eelworms, the stems and leaves by parasitic fungi, and the fruits by various disease organisms. Before very long his soil may be so infested with the germs of all these undesirables that it is little better than a deathtrap for his plants, and has therefore to be thrown out.

Many of these difficulties would vanish if all life could be destroyed in the soil, the manure, the chinks and crevices of the house, &c., leaving the crop as the only living thing. Growth under these simple conditions, however, although realisable in a scientific laboratory, is commercially impossible, because it now becomes a more difficult and expensive

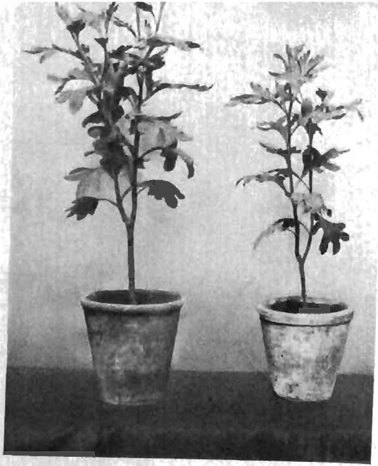
matter to feed the plant. The straw manure that plays so large a part in commercial greenhouse work is not itself a food of plants, but has to be worked up into various suitable substances. The process can, of course, be effected artificially at a certain price, but it is done for nothing in the soil. The active agents are bacteria visible only under powerful microscopes, but so numerous that a thimbleful of soil may contain from five to fifty millions of them. Great as they are these numbers do not represent the whole possibility, for the bacteria no more have a clear field than anything else, and never work at their maximum efficiency under natural conditions. Thus neither of the two living things the grower really wants—the crop and the food-making bacteria—can attain to their full development under the competition ordinarily going on in a greenhouse soil.

Recent experiments have shown that it is possible to simplify very considerably the population of the soil. The different inhabitants show very different degrees of susceptibility to heat and to poisons, the most resistant, fortunately, being the spores of some of the food-making bacteria, so that it is possible by selecting one's poisons to kill off various groups—not very sharply, of course, because there is considerable overlapping—and finally to kill everything, leaving a perfectly sterile soil. The same object may be attained by using various degrees of heat. Certain other effects are produced as well: the poison has some chemical or other action on the soil, and the heat causes some decomposition, but the net result of treatment with the less violent poisons and degrees of heat is that the food-making bacteria now have a clearer field, and can multiply and make much more food than before. Such treated soils are therefore well suited for glasshouse work because they are free from harmful and competing organisms. This differential treatment, whereby some organisms are killed and others are spared, is called Partial Sterilisation.

The effects of partial sterilisation are:—

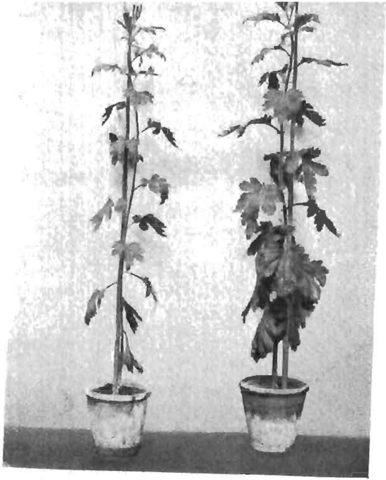
(1) the food-making processes in the soil are geared up so that the plant gets a larger supply of food than before;

(2) the food is not quite the same as usual because some of the bacteria have been killed; there are also some new sub-



a *b*

FIG. 1.
Chrysanthemums struck in untreated and in treated compost :
a. Compost heated to 200° F. *b*. Untreated compost.
(Stansted White.)



c *d*

FIG. 1 (*continued*).
c. Untreated compost. *d*. Compost treated with toluol.
(Reginald Vallis.)

stances present in the soil; the plant, therefore, develops rather differently than before;

(3) disease germs, weeds, &c., are killed.

For some time past we have been conducting experiments in our own and other glasshouses, and we propose in this paper to set out our results, to describe methods of partial sterilisation that can be carried out in practice, and more especially to describe the objects to be attained, so that the grower who feels that he can cheapen the methods shall know the nature of his task.

THE EFFECT OF PARTIAL STERILISATION ON THE FOOD SUPPLY OF PLANTS.

Two cases arise in greenhouse practice: (*a*) the plant is put up in a suitable compost and left without much added manure; (*b*) it is regularly and heavily (often excessively) manured with a variety of substances. Only in the first case is adequate use made of the extra food obtained by partial sterilisation; where large quantities of food are already added it is obviously useless to look for any benefit by adding more.

(*a*) *Plants grown in compost, but not frequently manured: Chrysanthemums.*—Mr. H. Burton Tate having very kindly allowed us access to his Harpenden glasshouses, we divided the compost into which the chrysanthemum cuttings were to be struck into three parts, heating one by steam to 200–210° F., treating another with toluol (½ per cent.), and leaving the third untreated. The compost was made up in the usual way by the head gardener, who also took the cuttings and carried the plants through as in the ordinary practice of a good private glasshouse. The cuttings were put in on December 5th, 1910, and were all found to strike at about the same time, no consistent differences being observed. They were potted up on March 10th, 1911, when it was noticed that the plants in the untreated soil had made rather better roots than the others. The plants were then transferred to a cold frame. Before long those in the treated soil began to go ahead, and on July 13th, when the photographs given in Fig. 1 were taken, they had larger leaves, stouter stems, shorter internodes, and generally a sturdier and altogether more promising aspect than those on the

untreated soil. In spite of their improved growth they had no appearance of coarseness or rankness. The advantage of the treatment is obvious; it is well known that attempts to force chrysanthemum cuttings by stimulating manures may lead to disaster, but we saw no sign of any ill effects on our plants.

Spinach.—This crop was grown under glass by one of us in a good loam rich in chalk. The plants in the heated soil (200–210° F.) made good growth, producing large leaves of a rich green colour, and showing little tendency to run to seed. Those in the untreated soil were much smaller and ran to seed more rapidly. The relative weights of the plants obtained were:—

Time of Sowing.	Early Spring.	Summer.	Autumn.
Untreated Soil	100	100	100
Heated Soil (200–210° F.) ...	447	150	184

In our experience it very commonly happens, as here, that the most marked effects are produced on the early spring crops.

Radishes.—This crop was grown along with the spinach in some of the same soil. Seven successive sowings were made, but no manure was supplied; the first three crops were much larger and earlier on the heated soil, but the last three were practically alike on both soils. The relative weights were:—

	1st Crop.	2nd Crop.	3rd Crop.	4th Crop.	5th Crop.	6th Crop.	7th Crop.
Untreated Soil ...	100	100	100	100	100	100	100
Heated Soil (200–210° F.) ...	216	355	172	128	103	114	103

After the seventh crop the heated soil was reheated and sown with an eighth crop; it was now found to be markedly superior to the untreated soil, giving a yield of 186 against 100 on the untreated.

These results show how advantageous partial sterilisation is for soil thrown out from a greenhouse or a spent hot bed into a cold frame, and sown with crops that have to go through without much feeding or attention.

Tomatoes in a Cool House.—A large grower of tomatoes at Waltham Cross kindly furnished us with a quantity of the soil used in that district for commercial growing. The seed was sown in the usual way on February 22nd,

1911. The young plants took longer to come through in the steam-sterilised soil than in the other soils. They made best growth in the soil heated to 130° F., the difference showing clearly by March 6th; a little later those in the soils treated with toluol and carbon disulphide * began to go ahead, but not until three weeks had elapsed after sowing did the plants in the steam-sterilised soil even catch up to those in the untreated soil, and it was eight weeks before they began to show any marked superiority. Flowers appeared first on the plants grown in the soil heated to 130° F. and in the steam-sterilised soil dressed with basic slag, and last on those in the untreated soil. The plants on the treated soils not only lasted longer, but produced much more fruit than those on the untreated soil. Some of them are shown in Fig. 2. The weights were:—

—	Un-treated.	Partially sterilised by				
		Heat.			Chemicals.	
		200°	200° + basic slag.	130°	Toluol.	Carbon di-sulphide.
Relative plant weight, dried (leaves, stems, &c, no fruit)	100	132	123	119	112	117
Relative weight of fruit ...	100	342	332	339	366	346
Actual weight of fruit per plant (grams)	160	546	530	540	585	553
Fruit produced per 100 parts of dry plant weight	780	2,020	2,110	2,220	2,540	2,300

In this experiment the plants were not fed, our object being to ascertain what the unaided soil can do after it has been treated. It will be noticed that the extra growth of leaf is not produced at the expense of the fruit, for we obtained much more fruit per 100 parts of plant weight off the plants on the treated than on the untreated soils.

We do not wish to lay too much stress on the actual fruit increase obtained, because there were only five plants in each set, and fruiting is very much affected by details of management. We can, however, legitimately conclude that

partial sterilisation has caused a considerable increase in yield of fruit.

Vines.—We have not ourselves made any experiments on vines, but from results communicated to us it appears that partial sterilisation has produced marked increases in growth. The method adopted was to inject toluol into the borders.

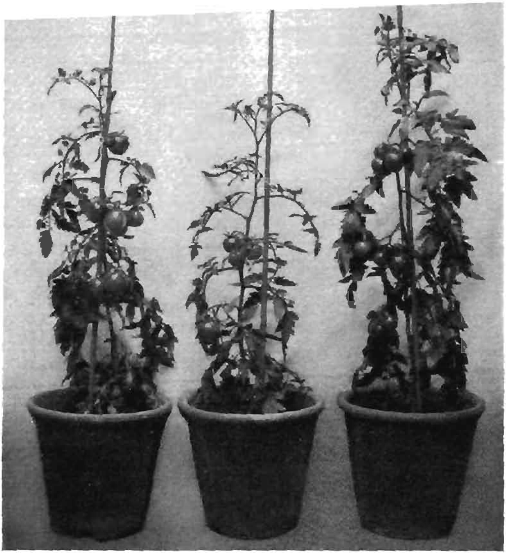
Flowers.—Simultaneously with the spinach and radish experiments a number of flowering plants—Clarkias, Verbenas, Nicotianas, Dianthus—were tried, and all gave better growth and more flowers on the steamed than on the untreated soil.

Partial Sterilisation and Food Supply: (b) Plants regularly and sufficiently manured.—If the plant is to be supplied with regular and sufficient doses of manure no advantage is likely to be seen from the food derived from the soil by bacterial action, for no plant can utilise more than a certain amount of food. In such cases partial sterilisation is advantageous only for its secondary effects, which may not always be worth having at the cost. Examples are furnished by some of the plants grown in Mr. Tate's glasshouses. The compost was made up freshly with virgin loam and other clean materials, everything being free from disease organisms and pests, as the subsequent growth proved; the plants were also liberally manured.

Cinerarias certainly started somewhat better in the steamed compost, and began coming into flower before those on the untreated soil, but their weekly dose of cow manure water clearly sufficed for their needs, the limiting factor now being not food but something else. Consequently when the plants were moved into the conservatory there was little if anything to choose between them, and nothing to justify the trouble of partial sterilisation.

Carnations and *Malmaisons* fed regularly with a proprietary carnation manure made full growth on the untreated soil, and therefore did no better on the steamed soil. The same thing happened in the case of *Schizanthus*.

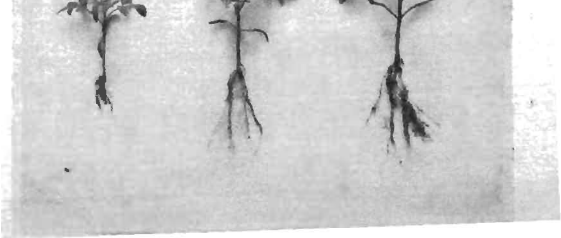
Melons ripened rather sooner on the steamed soil than on the untreated, and in the case of one variety (Sutton's A1) gave a more rounded and somewhat smaller fruit. Otherwise the crops on the two soils seemed identical. The experi-



a *b* *c*

FIG. 2.

Tomatoes grown in turf in cool house, no manure added. *a*. Soil heated to 130° F. *b*. Soil untreated. *c*. Soil heated to 200° F.



ment, however, requires to be repeated with a larger number of plants.

Cucumbers.—The gross-feeding cucumber benefited more from partial sterilisation, the plants fruiting better on the steamed soil. A similar result has been obtained in another house, where also the earlier ripening on the steamed soil was very noticeable.

SECONDARY EFFECTS OF PARTIAL STERILISATION.

The secondary effects of partial sterilisation arise from two causes: (1) the plant does not live on its usual nitrates but on ammonia, at any rate until reinfection of nitrifying organisms has taken place; other soluble compounds may be utilised also; (2) some of the soil decomposition products have a physiological action on the plant, modifying it in certain ways.

Retardation of Germination and Seedling Growth.—The grower's first experience of partial sterilisation may be very disappointing; he will often find that seed germinates more slowly and produces smaller seedlings in the treated, and especially the steamed soils, than in the untreated soils. The precise cause of the retardation is not yet ascertained, and consequently no remedy can be suggested, but it probably arises from the excess of ammonia and other decomposition products, which are useful enough for older plants, but form too aldermanic a diet for the seedling. The amount of retardation varies with the soil, the method of sterilisation, the seed, and the conditions of growth. It was very slight, if it occurred at all, on the chalky loam used for the spinach and radish experiments. It was very marked in a rich cucumber soil, and still more on a turf, and was more pronounced the higher the soil had been heated, up to a certain point. There are indications, however, that the harmful effects passed off after a time. Often there was no retardation, but an acceleration both of germination and of seedling growth in soil heated only to 130° F.

Poor seeds and old seeds appear to be most affected. Tomatoes appear to be specially susceptible, more so perhaps than cucumbers. Different varieties are not equally susceptible. In working with melons, for ex-

ample, Sutton's A1 recovered in four weeks, while Ringleader took five weeks. It commonly happened that recovery was delayed till after the third and fourth leaves were out.

Figs. 3 and 4 illustrate the two common cases; in Fig. 3 steam-sterilisation has produced some condition detrimental to the young plant which was not produced at a temperature of 130° F.; in Fig. 4, however, the harmful effect had passed off very rapidly. There was no obvious reason for the difference.

Soon after the new leaves are out the retarded plants make more rapid growth and soon catch up the plants on the untreated soil, and, if no manure is being given, pass them. The retardation therefore need cause no anxiety, but it is an undoubted disadvantage, and is receiving careful investigation.

Fungus Development.—Some of the products formed by heating rich soils to 200° F., or more, are very favourable to the development of certain fungi, and if any of their spores happen to be about (as is usually the case) a rapid growth of mycelium begins in the surface layer, followed by a crop of small, yellowish, saucer-like fructifications. The fungus then disappears, and is not seen again; it causes no injury to the plant so far as we have been able to observe, but while it lasts it sometimes binds the surface of the soil so solidly that the young plant may have a difficulty in getting through. The common form in our experiments was a *Rhizina*, probably *R. inflata*; it did not occur to any marked extent on the soils heated to 130° F. or treated with toluol or carbon disulphide.

Root Action.—The root action is sometimes, but not always, retarded in the early stages of growth in soils heated to 200° F. Like the retardation of germination, the effect is erratic. The same grower has obtained in August a good root development, and in January a very poor one, in heated soils. This problem also is under investigation with the view of discovering a remedy.

Later on, however, the soil heated to 200° F. stimulates root action in a most remarkable way. Applied as a top dressing to pots containing tomato plants or to borders where cucumbers were growing, it caused a rapid growth of fibrous

a *b* *c*

FIG. 4.

Young tomato plants grown in conditions similar to those of Fig. 3, but showing acceleration in both the heated soils. *a*. Soil heated to 130° F. *b*. Untreated soil. *c*. Soil heated to 200° F.

a *b* *c*

FIG. 5.

Roots of tomato plants grown in (*a*) Tomato "sick" soil heated to 130° F., (*b*) some of the same lot of soil untreated, (*c*) the same soil heated to 200° F.

root, as seen in Fig. 5. The effect is not easy to explain, and is not shown to nearly so marked an extent in soil heated to 130° F., although at this temperature eelworms and other pests are killed, while it is scarcely shown at all in soils treated with toluol and carbon disulphide. But steamed soil is a very useful medium for plant growth wherever good fibrous root development is wanted.

The Appearance of the Plant.—Plants grown on steamed soils show, in comparison with those on untreated soils, larger leaves, stouter stems, a darker green colour, shorter joints, and a more compact vigorous habit. The actual amount of shortening of the joints depends on the plant; it was not noticeable in our tomatoes, but was very distinct in the chrysanthemums, and we have observed it in cucumbers; it is very marked in our outdoor experiments with rye, mustard, &c.

In spite of the extra growth on the steamed soils the plant is not rank or coarse, a result we attribute to the nature of the food it is now taking up. It flowers earlier and produces a greater quantity of fruit than others on untreated soils, excepting, of course, where the difference between the soils has been swamped by liberal manuring.

Quality of Fruit.—In the case of tomatoes and cucumbers, the only fruits we have as yet studied, the quality of fruit is better on the steamed than on the untreated soil. During the present season cucumbers grown on heated soils in a large commercial glasshouse have shown a marked improvement in quality, although there was no noticeable increase in quantity, which indeed is probably already a maximum for the general conditions. Our own tomatoes were sent to an expert of irreproachable taste and judgment, who arranged them as follows:—(1) From toluol-treated soil, finest in flavour; (2) from steamed soil, very good, sweet; (3) from untreated soil, poorest in flavour.*

Leguminous Plants.—As is well known, leguminous plants differ from others in the manner of their nitrogen nutrition,

* A grower who now partially sterilises soil on a large scale has kindly offered to put on rail a cart-load or truck-load of steamed soil at a nominal charge in order that anyone interested may try the effect of such soil on plant growth without having to put up a steriliser. We shall be happy to put anyone into communication with this gentleman.

and they show certain peculiarities in steamed soil. They are particularly susceptible to the toxic substance present; clover still refuses to grow in pasture soils heated to 208° in March, 1908, although it is sown three or four times a year. Toluol, however, has much less drastic an effect and will even produce a marked increase in crop if the proper nodule organisms are added. Much depends on the nature of the soil: the chalky loam already referred to produced, even after steaming, no bad effect on dwarf beans and sweet peas although no improvement was seen, whilst it not only caused no injury to sainfoin, but led to an increased crop. Mr. Holmes, of Norwich, also tells us that he has raised sweet peas perfectly well on heated soil. Much further information is wanted about the effect of soil treatment on the growth of leguminous plants.

EFFECT OF PARTIAL STERILISATION ON INSECT AND OTHER PESTS, WEED SEEDS, ETC.

Eelworms.—From the growers' point of view the eelworms of the soil may be divided into two groups: the parasitic forms, such as *Heterodera radicicola*, which causes the knots or club on the roots of tomatoes and cucumbers; and the free-living forms, *Rhabditis, Diplogaster*, &c., which so far as our observations go are without injury to the healthy plant. It is easy to demonstrate the presence of the free living forms in a soil, because they tend to cluster round decaying vegetable or animal matter, &c.; thus they may readily be trapped in a piece of meat or of mangold, or in a large seed such as the broad bean, left a few days in the moistened soil. But we know of no certain way of detecting *Heterodera* except by examination of the roots, or the washings from the roots, of the host plant.

The conditions of greenhouse culture favour the development of the parasitic eelworms to an extraordinary extent. Fig. 5*b* shows the root of a tomato plant grown on a soil from a tomato house; it is no exaggerated specimen, and demonstrates one cause why tomatoes cannot be grown indefinitely in the same soil. A number of soils have been sent to us from commercial cucumber and tomato houses, so-called "sick" soils, all of which contained quantities of *Hetero-*

dera radicicola, and of the free-living *Rhabditis terricola* and *brevispina*, *Diplogaster* sp., together with some *Cephalobus*, *Plectus granulosus*, &c. *All these forms are killed by heating the soil to* 140° *F.*, and when we heated the soil to 200° F. and grew tomatoes, we obtained the other root shown in Fig. 5c.

We have never observed reinfection of *Heterodera* in the steamed soil, although we took no special precautions to exclude it; we did, however, find that the free-living *Rhabditis* and *Diplogaster* got in again unless the soil was kept carefully covered up. The point is of considerable importance to the horticultural investigator, because it shows that the subsequent presence of these easily detected free-living forms is no necessary proof that a certain treatment has failed to kill eelworms, nor does it imply that the really dangerous *Heterodera* is present.

Toluol and carbon disulphide readily kill all free-living forms, but not all the *Heterodera*. These, however, have more opportunities of escape from a poisonous vapour than the others, since some of their eggs are enclosed in dead females, the body walls of which make a good protective membrane.

Other Animals.—The untreated "sick" soils received from the tomato and cucumber houses also contained numbers of other animals, including white worms (*Enchytraeidae*), wireworms, springtails, millipedes, centipedes, mites, woodlice, &c., but all were killed at 200° F., together with their eggs, so that none of them subsequently reappeared from the soil. There was, of course, some reinfection from outside, springtails, &c., getting in from neighbouring pots. Lower temperatures (130° F.) were in our experiments also effective, but we do not recommend them for practical work. Carbon disulphide killed all woodlice and other animals, but toluol was less fatal.

Fungoid Pests.—As we had no outbreak of any fungus disease, in spite of our use of "sick" soils, we were not able in the present series of experiments to study the effect of partial sterilisation on the fungus spores. Mr. W. Dyke has been studying the wilt fungus (*Neocosmopara Vasinifecta*) that attacks the roots of cucumbers and melons, doing con-

siderable damage in certain districts, and informs us that steam sterilisation and treatment with a certain disinfectant effectively kills the spores and leaves the soil capable of carrying perfectly clean healthy plants. An outbreak of "gumming" (*Cladosporium scabies*) occurred on the cucumbers in a house where some of our experimental plants were growing, but there was no obvious difference in the incidence of the disease between the treated and the untreated sections of the borders.

Weed seeds are all killed at 200° F., so that boxes or pots of steamed soil are readily distinguished from untreated soil by their freedom from weeds.

THE TREATMENT OF GLASSHOUSE "SICK" SOILS.

Our investigations show that "sickness" of tomato, cucumber, and other soils is due to two causes acting together —a lowered efficiency of the plant food-makers, and an accumulation of disease organisms. Both these causes are removed by partial sterilisation, most completely by heating to 200° F. which has the further advantage of effecting some decomposition of the organic matter, but also to a greater or less extent by various antiseptics. We have carefully studied eight "sick" soils, and found in every case that partial sterilisation effected a satisfactory improvement. The chemical and other examinations that have been made need not be referred to here; it is sufficient to give the weight of the plants to show that the fertility of the soil has been restored, and the weight of the fruits to show that the new growth is not simply rank foliage but leads to greater fruit production. (See table on next page.) Fig. 6 shows two of the plants, and Fig. 7 shows the relative yield of fruit.

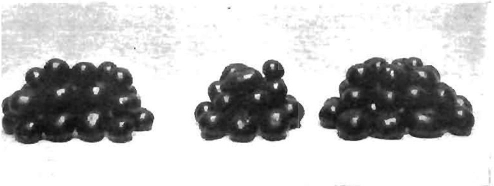
The present method of dealing with "sick" soils is to throw them out from the glasshouse and replace them by virgin soils, carted sometimes from a considerable distance. "Sickness" so speedily sets up in a cucumber house, with its high soil and air temperatures (80° F. or more), and its extraordinarily high manure and water supply, that the soil has to be thrown out each year at considerable expense, and at the sacrifice of all the valuable manurial residues. Soil in a tomato house, which is run at an altogether lower pitch, lasts

a *b*

FIG. 6.
Tomato plants grown in (*a*) tomato "sick" soil and (*b*) some of the same lot of soil heated to 200° F.

a *b* *c*

FIG. 7.
Fruit obtained from tomatoes raised on untreated and on treated "sick" soils.
a. Soil heated to 200° F. *b*. Untreated soil. *c*. Soil heated to 130° F.



d *e* *f*

FIG. 7 (*continued*).
d. Soil treated with toluol. *e*. Untreated soil. *f*. Soil treated with carbon disulphide.

(*a*)—CUCUMBER SICK SOIL (B).

—	Un-treated.	Partially sterilised by: Heat. 200°.	Heat. 200° + basic slag.	Heat. 130°.	Chemicals. Toluol.	Chemicals. Carbon disulphide.
Relative plant weight, dried (leaves, stems, &c., no fruit)	100	163	175	125	139	116
Relative weight of fruit ...	100	204	225	129	119	124
Actual weight of fruit per plant, grams	320	654	722	415	380	398
Fruit produced per 100 parts of dry plant weight	1,280	1,600	1,640	1,340	1,100	1,360

Some club on untreated, not on other, soils.

(*b*)—TOMATO SICK SOIL (MC).

Relative plant weight, dried (leaves, stems, &c., no fruit)	100	188	178	112*	144	138
Relative weight of fruit ...	100	255	241	159	200	179
Actual weight of fruit per plant, grams	215	550	519	343	431	386
Fruit produced per 100 parts of dry plant weight	1,360	1,840	1,840	1,940	1,900	1,800

* Heated to 120° only.

(*c*)—TOMATO SICK SOIL (MT).

Relative plant weight, dried (leaves, stems, &c., no fruit)	100	170	—	103	107	104
Relative weight of fruit ...	100	161	—	116	133	138
Actual weight of fruit per plant, grams	446	720	—	518	595	615
Fruit produced per 100 parts of dry plant weight	1,575	1,525	—	1,775	1,975	2,100

Both in (*b*) and (*c*) very much club on untreated soil, some on soils treated with toluol and carbon disulphide and heated to 120°, very little on soil heated to 130° F., and none on soil heated to 200° F.

(*d*)—TOMATO SICK SOIL (Fed on two occasions).

Relative plant weight, dried (leaves, stems, &c., no fruit)	100	144	—	110	—	—
Relative weight of fruit ...	100	118	—	109	—	—
Actual weight of fruit per plant, grams	587	692	—	643	—	—
Fruit produced per 100 parts of dry plant weight	2,340	1,860	—	2,320	—	—

Some club on untreated soil, none on heated soils.

longer, but after several years also has to go. Our experiments show that this sick soil, after partial sterilisation, can again be made to yield full crops.

METHODS AND COST OF PARTIAL STERILISATION.

So far as the grower is concerned the whole problem resolves itself into one of cost. The advantages of partial sterilisation are:—

(1) A greater utilisation of the plant food constituents of the soil, resulting from the increased efficiency of the food-making bacteria;

(2) freedom from such insect and fungoid pests as reside in the soil;

(3) economy of soil and residual fertilising material, in that spent soil, sick soil, &c., can be used again.

These advantages do not appeal with equal force to all growers; they are worth very little to the man who is isolated from all risk of infection and has abundance of virgin soil and manure at his disposal; they become more significant where supplies of virgin soil and manure are more restricted, or, what is the same thing, have to be paid for; and, finally, they become very important for cucumber growers who annually sacrifice many tons of rich soil—some of it even richer than farmyard manure *—because it is no longer effective enough for them.

It is obviously futile for us to consider any methods of partial sterilisation that cost more than the advantages are worth. Fortunately the maximum value can be fixed by the value to the cucumber grower. The cost of wheeling out the old borders and purchasing and carting in new soil is variously estimated, but has been put by growers with whom we have discussed the subject at *2s.* to *3s. 6d.* a ton in a crowded district. In such a case the grower would still be in pocket if he paid *2s.* a ton to have his old soil treated,

* Two cucumber soils analysed by us had the following composition :

	Soil A.	Soil B.	Farmyard Manure (Rothamsted average).
Nitrogen	0·75	0·72	0·64
Phosphoric acid	0·56	0·73	0·23
Available phosphoric acid ...	0·36	0·46	
Potash	0·54	0·50	0·32
Available potash	0·12	0·10	

because by so doing he would recover some of the manurial residues it contains. We can therefore seriously consider methods costing 2*s*. a ton, and, of course, the lower we can get the price the better.

Sterilisation by Heat.—For a variety of reasons we consider that partial sterilisation by heat is the most effective method at present available. We say *at present* advisedly, because we have not yet examined all possible methods of chemical treatment, the advantages of which are obvious. The soil should reach a temperature of 200° F., but need not pass 210° F.; it should be maintained for an hour or more at a temperature exceeding 180° F. It is immaterial, so far as our present results go, whether dry heat or moist heat is used, *i.e.*, whether the soil is baked or steamed, but if steam is used the soil must not be allowed to get too wet, but the steam must blow through at a sufficient rate to prevent complete condensation. After sterilisation the heap should not be exposed more than necessary to the rain, as plant food rapidly begins to form, and is very liable to be washed out.

Steam Heat.—Growers in this country and in the United States have for some time known that steaming the soil killed certain pests, and they have devised various methods of carrying out the operation. Probably the best plan is to blow high-pressure steam through a harrow-like implement with jets corresponding to tynes buried in the soil. The most economical pressure has yet to be determined; we saw the method worked at some large nurseries with steam pressure at 80-90 lb., and found that the temperature of the soil rose in two or three minutes to 212° F., and the soil remained nearly as dry as before. In this case the heating was continued for 15 minutes, and the soil then thrown into a heap, but so slowly did it cool (soil being a very bad conductor of heat) that even after five hours the temperature remained at 160° F., while at the end of a week it was still 75° F. Account was kept of the cost of the operation, including the hire of the engine and all other charges, and it worked out to 1*s*. 6*d*. a cubic yard, which at the modest reckoning of only 20 cwt. to the cubic yard,* is still

* Rich cucumber soil is lighter than ordinary arable soil which would be nearer 20 cwt. per cubic yard.

well within our limits. As one engine dealt with 40 yards of soil per day, the method has obvious advantages for the large grower.

In another nursery, where only an old boiler was available, low-pressure steam was blown through a heap of soil covered with sacks. After some time the soil was thrown into a heap as before; it was moist, but not over wet. The cost in this case was 1*s*. 2*d*. per ton, but no allowance was made for the boiler (it was not thought worth it), and, of course, the process was slower than the previous one.

Dry Heat.—Two methods have been suggested: (1) Oven methods; (2) Hot-air methods. Oven methods present some difficulty. Owing to its bad conductivity soil only allows heat to penetrate slowly, and the temperature of a mass of soil in an oven is for a long time very uneven, the inside remaining cold long after the outer layers have got hot. Apart from this loss of economy there is in some forms of steriliser a danger of overheating part of the soil and getting beyond 210° F., a temperature we see no advantage in exceeding.

Hot air may be made to pass through the soil, thus obviating the drawbacks to the oven method, but a certain amount of heat is wasted through the evaporation of water from the soil.

On the other hand, the great advantage of the dry-heat methods is that they can be worked by means of the waste heat from the flues. When this is done there is no expense for firing, and the cost of treatment is reduced simply to labour and outlay on capital, neither of which need be large. Mr. Holmes tells us that he sterilises his soil in this way at 5*d*. per ton, inclusive of everything. The soil is left in the heater for about seven hours, three charges of about a ton each being treated in 24 hours.

Fuel Requirements and Efficiency.—The amount of water in the soil is a very important factor in determining the cost of the process. Dry soil requires only one-fifth the amount of heat that water requires to raise its temperature. Consequently there is a great increase in the fuel expenditure directly one begins to handle wet soil. This fact is brought out by the following results recently obtained by us:—

Soil.	Rich cucumber soil.			Tomato soil.		Arable soil.	
	Moist.	Drier.	Air dry.	Moist.	Dry.	Moist.	Dry.
Moisture (per cent.)	41·6	25	5·6	22·4	8·9	14·7	6·0
Specific heat	0·58	0·38	0·23	0·39	0·22	0·30	0·22
Thermal units (B.T.U.) required to raise 1 lb. of soil from 52° F. to 212° F. ...	92	61	37	62	35	48	35
No. of lb. of soil heated per lb. of fuel burnt, assuming 100 per cent. efficiency throughout	130	197	320	193	340	250	340

From these and other results we have drawn up the following rule by which the grower can form an approximate estimate of the number of thermal units (B.T.U.) required, if he simply knows the amount of moisture in his soil :—*Multiply* per cent. of dry soil (*i.e.*, 100 minus percentage of moisture) by 23 if the soil is rich, or 21 if it is poor, *add* 100 × percentage of water, *multiply* by 1·6, and *divide* by 100—*e.g.*, to find B.T.U. for rich cucumber soil containing 41·6 per cent. of water, 100 − 41·6 = 58·4

$$58{\cdot}4 \times 23 = 1342$$
$$41{\cdot}6 \times 100 = 4160$$
$$\overline{5502}$$

$\frac{5502 \times 1{\cdot}6}{100} = 88.$ Found by trial, 92. The rule breaks down for dry soils.

The number of pounds of soil heated per lb. of fuel burnt (100 % efficiency) is obtained by dividing the B.T.U. into 12,000, the calorific power of average quality coal.

The 100 per cent. efficiency is, of course, unattainable, partly because of the imperfections of boilers and boilermen, but mainly because it involves perfect retention and condensation of the steam, which is undesirable, because it would make the soil too wet. It will be a nice problem for the horticultural engineer to see what degree of efficiency can be attained; the best we have seen as yet is about 30 per cent., *i.e.*, 57½ lb. of soil heated per lb. of fuel, the cost being 3¾*d*. per ton of soil sterilised.

Chemical Treatment.—In principle the chemical treatment is much the simplest and the cheapest. If the right chemical could be found it would only have to be put into the soil and the work would be done; there would be no carrying soil to the steriliser and bringing it back again, and no trouble about the efficiency of the heating process. The following requirements have to be fulfilled: the substance must be (1) cheap; (2) volatile or decomposable, so that it disappears when its work is done and causes no subsequent interference

with plant roots or food-making bacteria; (3) fatal to eel-worms and other animals, to fungus spores, and to organisms interfering with the food-making bacteria; (4) no more harmful to food-making bacteria than a temperature of 180° F. Some commercial waste product is clearly indicated, and a suitable substance could no doubt be found among the numerous coal-tar products. Our own experiments have been made with pure substances, with the view of settling the various preliminary problems; it is now possible to study some of the waste products obtainable by the grower.

CONCLUSIONS.

1. Partial sterilisation of soil increases the supply of food for the plant, somewhat alters the growth of the plant, and kills insect pests.

2. It may cause a temporary retardation in germination and in early growth, the amount of which varies according to the nature of the soil, the seed, and the general conditions.

3. In our experiments it has not proved advantageous for pot work where abundant supplies of clean virgin soil and manure are available.

4. It is, however, very useful for work with borders, cold frames, and for plants that are to run for some time without manure. It leads to better root development, sturdier and healthier plants, earlier flowering, more prolific fruiting, and better quality of fruit.

5. It is particularly useful for commercial glasshouses where soil pests are a source of trouble, and soil "sickness" sets in.

6. At present the most effective method of partial sterilisation is to heat the soil to a temperature above 140° F., but not exceeding 212° F. Very satisfactory results have been obtained between 180° and 200° F.; ½ cwt. or less fuel is required per ton of soil; capital and labour charges depend on the speed at which the process is to be worked. Our experiments indicate that effective chemical treatment is also possible, and would, of course, be much simpler, but we have not yet tested a sufficient number of commercial products to discuss the problem from the grower's point of view.

HISTORY OF SCAWBY CREDIT SOCIETY.

Of the 44 Agricultural Co-operative Credit Societies now in existence in England and Wales, the Scawby Credit Society is the oldest. It may therefore justly claim to be the pioneer in this country of the movement for enabling small agriculturists, by combining their credit, to obtain small loans for agricultural purposes on easy terms; and as it has satisfactorily achieved its object, and has now attained a sound financial position, an examination of its history may not be without profit to younger Credit Societies, or to agriculturists who feel the need of some such means of obtaining credit on more favourable conditions than are at present available to them.

Scawby is a rural parish in Lincolnshire, about two miles from the market town of Brigg. It has a population of about 1,000, and an acreage under crops and grass of 2,825 acres, of which two-thirds are under crops, and one-third under grass. The land is held in 39 holdings, of which 26 are under 50 acres each. A number of the small-holders have other occupations besides agriculture. There is no other local industry, and the parish is typical of many other country parishes in England.

On July 3rd, 1894, after a public meeting had been held under the Chairmanship of Mr. Sutton Nelthorpe, the principal landowner in the parish, and had been addressed by Mr. H. W. Wolff, a leading authority on Co-operative Credit, and by Mr. Leman, Secretary of the Agricultural Banks Association, it was resolved to form an Agricultural Credit Society for the parish of Scawby. Further meetings were held to discuss the proposed rules, and the Society was finally registered under the Friendly Societies Act on November 1st, 1895. The rules provide that the object of the Society is to create funds to be lent out to its members, and that every loan must, in the opinion of the Society, hold out a sufficient prospect of repaying itself by the production, business, or economy which it will enable the borrower to effect. No part of the funds can be divided by way of profit, bonus, dividend, or otherwise among the members; any surplus accruing to the Society after payment of the costs

of management must be carried to a Reserve Fund, which can be drawn upon only to meet exceptional losses by vote of the General Meeting of the members. Only persons (male or female (owning or occupying land or residing in the parish of Scawby or its immediate neighbourhood can be members, and each applicant must be approved by the Committee. Each member has only one vote, and all the members are liable to an equal levy, should funds be required to make up any deficiency in the working of the Society—that is, all the members are equally, jointly, and severally liable for any debts incurred by the Society, and no limit has been fixed for their liability. There are no shares and no share-capital.

The Society started with 9 members, but by the end of 1895 there were 20. The number of members has since risen gradually until at the end of 1910 there were 32, of whom 11 were small farmers, 3 market gardeners, 3 blacksmiths, and 2 carpenters, besides a butcher, a horse-dealer, a carter, a woodman, a miner, a foreman, and 2 labourers, most of whom, in addition to their main occupations, cultivate small holdings or allotments. The affairs of the Society are managed by the Chairman and a Committee of 6, annually elected by ballot at the general meeting. They at present consist of 3 small-farmers, a carpenter, a blacksmith, and a woodman. Mr. Spencer, the rate-collector of the parish, has from the first, as Secretary and Treasurer, kept the accounts and minutes without any salary. Mr. Nelthorpe has been Chairman of the Society since its foundation.

One of the first requisites for the working of the Society was the raising of money to be lent to the members. With this object the Chairman offered to guarantee £100, and was joined by Mr. Yerburgh (now Chairman of the Agricultural Organisation Society), who proposed to guarantee £50, and by the Rev. H. F. Oliver, the Vicar, who offered either to guarantee £50 or to lend the Society £100 at 3½ per cent. It was afterwards found that the rules as they then stood (they have been altered since) prevented the adoption of this system of guarantees, and the ultimate arrangement made was that an account was opened with the local branch of a Joint Stock Bank, to which the Chairman, both on his own behalf and as representing the Society, gave

a guarantee limited to £100 for any sums that might be due to the Bank by the Society. Under this guarantee the Society obtained funds from the Bank, and at one time its over-draft amounted to £94, but for the last two years, owing to the growth of deposits, it has not required to over-draw its account at the Bank, and has generally had a balance to its credit. The Bank charges 5 per cent. on overdrafts, and allows 2 per cent. on current account credit balances.

The Society also offered to take deposits at 3 per cent. interest, and at the end of the first year had obtained in this way £39, but by the end of 1910 it had so gained the confidence of the villagers that the amount on deposit with the Society at 3 per cent. had mounted up to £186, including a considerable sum deposited by the village Dividend Society, formed of working people. Deposits must be left with the Society for a period of not less than three months, and one month's notice must be given of withdrawal; and the Society retains the right to return any surplus of deposits it does not require, on giving one month's notice to the depositor.

The main object of the Society is to make loans to its members for profitable purposes at a low rate of interest. The first loan granted was one of £30 to a small-holder to enable him to buy lambs to consume feed, the full profit of which he would not otherwise have obtained, and was made repayable in 8 months. In the first year only 2 loans were granted, in the next 1, and in the third 2, but the number of loans gradually increased, and in 1910 6 loans were made, aggregating £175. During the last 16 years the Society has made to its members 78 loans, aggregating £2,300, and averaging nearly £30, the smallest loan being £5, and the largest £50, which is the maximum loan allowed by the Act. At first the Society charged 5 per cent. per annum interest on loans, but it soon raised this rate to 6 per cent. in order to build up a reserve fund. When that object had been attained, it 3 years ago reduced the rate to 5 per cent., at which rate its members can now obtain from the Society the capital they require for their agricultural operations.

Loans to members must be expended on some specific purpose, approved by the Committee as likely to be profitable to the borrowing member. The purposes for which

loans have been granted have been, for example, to enable the borrower to buy cows, sheep, lambs, pigs, or seed, or to hold over stock or corn for better prices. Loans are generally made repayable at the time when the profits of the transaction are likely to come in to the borrower and for periods varying from 3 months up to 2 years, which is the maximum period allowed by the Act. The longer term loans are usually made repayable by instalments. In order to secure the Society against loss, the Committee require the borrower to give security approved by them for the punctual repayment of the loan, generally in the form of two sureties, who may or may not be members of the Society. The Committee carefully watch the utilisation of the loan on the object for which it was granted, and insist on punctual repayment, though they give the borrower time on good cause shown. On three occasions they have had to call on the sureties to make good part of the loan, but the Society itself has made no bad debts, and has incurred no loss. It is believed that the sureties ultimately recovered the amounts they had paid. No repayments of loans were overdue at the end of 1910. Several of the members say the existence of the Society has enabled them to undertake profitable transactions with sums borrowed from the Society, which they could not have obtained elsewhere, and one family at least has, by its own thrift and industry, and with the help of successive loans from the Society, risen from the position of day-labourers to that of substantial small farmers.

One borrower repaid his loan three months before it was due, cheerfully paying interest for the full term for which it was borrowed, as he said that the loan had benefited him greatly, and he wished in return to benefit the Society. Another man, who had borrowed £5 to enable him to hold over his fat pig for a better price, also repaid his loan before it was due, with interest in full, saying he considered the transaction had left him ten shillings to the good.

Seeing that the whole work of the Society is done for nothing, the expenses of management, which consist chiefly of cost of stationery and affiliation fees to the Agricultural Organisation Society, have been small. In 1910 they amounted only to 12s. for the year. And, seeing that for

the bulk of the Society's transactions it borrows from depositors at 3 per cent., and lends to members at 5 per cent., it has a margin of profit on such transactions of £2 on every £100 every year. During the first year there was a loss, as the Society had to pay a registration fee of £1 (no fee is now charged for registration), but since then there has been a profit every year, beginning with 10*s*. in the second year, and rising to £5 6*s*. 5*d*. in 1910. Under the rules all profits must be carried to a Reserve Fund, which has gradually mounted up year by year, until in 1910 it was £64 16*s*. 5*d*., including a gift of £15 made to the Society by the Chairman. The Reserve Fund is the property of the Society, which pays no interest on it, so that any interest received on this surplus is clear gain to the Society, and a further means of adding to the Reserve Fund. This Fund cannot, under the rules, be divided among the members, nor can they derive any direct profit as sharers in the Society. Its uses are to give confidence to depositors, who see that the amount in reserve is readily available to meet their claims, and to the members, who feel that any unforeseen loss, such as the improbable failure of both borrower and sureties to repay a loan, can be met from the reserve fund without their having to contribute towards it. The interest on the Reserve Fund also goes to swell the income of the Society, and thus makes it possible to reduce the rate of interest charged on loans, as was done by the Society three years ago.

The financial position to which the Society has attained, as disclosed by its balance-sheet at the end of 1910, is highly satisfactory. It then possessed altogether £255, of which £153 had been lent out to members, and the remainder, which was in excess of the amount then wanted on loan by members, was mainly deposited with the Central Co-operative Agricultural Bank, Ltd., at 3 per cent. interest. Its liabilities were only £186 principal, and £4 10*s*. 6*d*. interest, due to depositors, and on this principal it paid only 3 per cent. interest. So that, as already said, its surplus profits, or reserve fund, amounted to nearly £65. It has acquired such good credit in the neighbourhood as to obtain on deposit all the money its members require as loans, and its members can borrow the capital they want for agricultural purposes at thr

low rate of 5 per cent. per annum, or one penny per £ per month. Few agriculturists in England can borrow at a lower rate than this.

In 1910 the Reserve Fund equalled one-third of the total amount of the loans granted, and it is being added to at the rate of over £5 a year. It seems hardly necessary to go on increasing it at this rate, and the Society might, if it chose, utilise the advantage it has gained in some such way as the following:—

It might repay its Chairman his generous gift of £15, of which it now stands no longer in need, and so add to the self-respect of the members. The remaining £50 of its Reserve Fund it might deposit in a separate account with the Post Office Savings Bank or Local Joint Stock Bank, and so make it no longer a part of the working capital, but a true reserve, only to be drawn on by special resolution of the general meeting of the Society. It would receive on this at 2½ per cent. an annual interest of £1 5*s*., which would cover its present annual working expenses, and leave a small surplus. If it continued as at present to hold deposits of about £180 at 3 per cent., and to lend about as much to members at 5 per cent., it would have on this business a margin of £3 12*s*. per annum, which it could employ to pay a small salary to its Secretary, to whose good account-keeping much of its success is due. If it does not think it necessary to pay its Secretary a salary, then, seeing that the interest on its reserve more than covers the cost of the administration, it could actually now afford to lend money to its members at the same rate at which it can borrow—that is, so long as depositors lend it money at 3 per cent., it could make loans to its members at 3 per cent., and still go on adding to its reserve.

It will thus be seen that the Scawby Credit Society, besides being the pioneer Agricultural Credit Society in England and Wales, may well be taken as a model of good and successful management by small agriculturists who wish to combine their personal credit, and so obtain loans for their agricultural operations at a low rate of interest.

PROGRESS OF SCAWBY CREDIT SOCIETY

I.

Year.	Number of Members at end of Year.	Loans Granted during the Year.		Rate of Interest Charged on Loans.	Deposits Received during the Year. Amount.	Rate of Interest paid on Deposits.	Expenses of Management.	Profit or Loss on the Working of the Year.		Remarks.
		Number.	Amount.					Profit.	Loss.	
			£		£		£ s. d.	£ s. d.	£ s. d.	
1895	20	2	50	5	39 (includes £5 special loan)	3	1 0 0	—	0 18 7*	*Paid Registration Fee, £1.
1896	20	1	40	6	12	3	0 0 5	0 10 0	—	
1897	22	2	40	6	15	3	0 0 6	1 0 8	—	
1898	25	4	110	6	20	3	0 0 6	0 19 7	—	
1899	26	4	90	6	—	3	0 1 1	1 12 4	—	
1900	25	5	107	6	50	3	0 16 4†	0 8 0	—	† Paid Registrar, 10s.
1901	27	7	220	6	75	3	0 10 8	3 11 9	—	
1902	28	5	145	6	10	3	0 8 8	3 16 8	—	
1903	29	6	170	6	10	3	0 7 1	4 0 1	—	
1904	29	8	270	6	50	3	0 11 0	5 2 5	—	
1905	28	5	180	6	15	3	0 11 0	6 1 11	—	
1906	28	5	145	6	—	3	0 9 6	4 13 5	—	
1907	27	6	100	6	—	3	0 18 6	3 14 6	—	
1908	28	6	200	5	71	3	0 18 10	4 2 6	—	
1909	29	4	147	5	25	3	0 12 2	5 8 8	—	
1910	32	6	175	5	50	3	0 12 0	5 6 5	—	

II.

Year.	Assets at end of Year.				Liabilities at end of Year.				Total Profit or Loss to date at end of Year.	
	Cash.	Loans Due from Members.	Other Assets.	Total Assets.	Due to Banks.	Due to Depositors.	Other Liabilities.	Total Liabilities.	Profit.	Loss.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1895	—	50 12 4	1 12 4	52 4 8	11 7 9	39 4 6	2 11 0	53 3 3	—	0 18 7
1896	—	41 0 6	1 11 8	42 12 2	8 16 0	31 4 9	3 0 0	43 0 9	—	0 8 7
1897	0 0 3	41 7 0	0 1 10	41 9 1	6 11 6	34 5 6	—	40 17 0	0 12 1	—
1898	0 17 8	101 16 0	0 1 5	102 15 1	60 15 6	40 7 11	—	101 3 5	1 11 8	—
1899	—	50 8 9	0 1 0	50 9 9	31 18 1	15 7 8	—	47 5 9	3 4 0	—
1900	—	103 8 7	0 0 7	103 9 2	34 10 11	65 4 3	0 2 0	99 17 2	3 12 0	—
1901	—	194 13 9	—	194 13 9	69 4 3	102 11 9	0 8 0	172 4 0	22 9 9§	—
1902	—	148 15 5	—	148 15 5	61 16 1	60 3 6	0 9 5	122 9 0	26 6 5	—
1903	—	138 3 0	—	138 3 0	37 16 6	70 0 0	—	107 16 6	30 6 6	—
1904	—	219 13 0	—	219 13 0	94 4 0	90 0 0	—	184 4 0	35 9 0	—
1905	—	200 11 0	—	200 11 0	54 0 1	105 0 0	—	159 0 1	41 10 11	—
1906	—	137 7 0	—	137 7 0	36 2 8	55 0 0	—	9[illegible] 2 8	46 4 4	—
1907	—	104 14 0	2 10 0	107 4 0	2 5 2	55 0 0	—	57 5 2	49 18 10	—
1908	—	192 2 2	7 10 0	199 12 2	33 12 10	111 18 0	—	145 10 10	54 1 4	—
1909	6 19 11	183 6 7	7 10 0	197 16 6	—	138 6 6	—	138 6 6	59 10 0	—
1910	17 14 10	152 18 10*	84 13 3†	255 6 11	—	190 10 6‡	—	190 10 6	64 16 5	—

* Loans £150 0 0
Interest 2 18 10
£152 18 10

† *I.e.* assets £87 12 1
Less interest 2 18 10
£84 13 3

‡ *I.e.* Deposits £186 0 0
Int. due on deposits. 4 10 6
£190 10 6

§ Includes a gift of £15 6*s.*

IMPORTS OF AGRICULTURAL PRODUCE IN 1911.

The total value of the principal articles of food imported into the United Kingdom in 1911 was £190,712,000, as against £189,418,000 in 1910, £191,505,000 in 1909, £183,957,000 in 1908, £188,353,000 in 1907, £181,604,000 in 1906, and an average of £177,047,000 in the three years 1903–1905. These figures represent the value (cost, insurance, and freight), as declared to the Customs officers at the port of arrival, of the grain and flour, meat and animals for food, butter, cheese, eggs, condensed milk, fruit and vegetables, hops, lard, and margarine, which may be grouped together as agricultural food products in the sense that they compete more or less directly with the home supply.

The increase in value during the past year as compared with 1910 was due to the increased cost, on the whole, of the meat (of all kinds) and dairy produce imported, the total value of the items included under the general heading of meat amounting to £49,737,000, as compared with £48,879,000 in 1910, and the imports of butter, cheese, and eggs together amounting to £39,708,000 in 1911, as compared with £38,599,000 in 1910. On the other hand, the value of grain and grain products was less than in 1910 by £1,500,000.

Cattle and Beef.—The past year has seen a further decline in the number of live cattle imported into the United Kingdom, the number received being 200,397, or about one-third of the imports in 1895. Only two countries (apart from the Channel Islands) participate in this trade, viz., the United States and Canada. An increased export from the United States to this country was accompanied by a decreased export from Canada.

The decline in this direction was more than compensated for by the extensive imports of beef, chiefly chilled and frozen, which amounted in the aggregate to 7,362,434 cwt., the highest figure yet recorded. The imports of fresh beef, however, decreased by nearly 50,000 cwt. The main source of supply of chilled and frozen beef is Argentina, from which country 3,753,140 cwt. of chilled beef, and 2,357,878 cwt. of frozen beef were received. A noticeable feature here is the extension of the chilled beef trade (representing the better

class of meat), which increased to the above figure from 2,710,747 cwt. in the preceding year, whereas the frozen beef imports have remained fairly steady for several years. Another point in connection with the chilled beef trade which is worthy of mention is the continuous decline in the supplies from the United States. In 1911 the very small amount of 169,000 cwt. was received from this source. The imports of frozen beef from Australia, New Zealand, and Uruguay also showed large decreases. The chilled beef from all sources averaged 32*s*. per cwt., while the frozen beef was several shillings lower, viz., 28*s*. per cwt.

The weight of beef represented by the imports of cattle may be estimated at 1,308,000 cwt., which, added to the imports of fresh and refrigerated beef, make the total receipts of meat of this class from abroad in 1911, 8,670,000 cwt., or nearly 21½ lb. per head of the population. In 1910 the figures were 8,432,000 cwt., representing 20¾ lb. per head; in 1909 8,217,000 cwt., or 20⅓ lb. per head; in 1908, 8,115,000 cwt., or 20⅔ lb. per head; in 1907, 8,806,000 cwt., or 22⅓ lb. per head; and in 1906 9,170,000 cwt., which was equal to 23½ lb. per head.

Sheep and Mutton.—The number of live sheep imported rose from 427 in 1910 to 47,673 in 1911, these figures being also larger than the imports in 1909. The quantity of mutton imported on the other hand showed a decrease from 5,406,000 cwt. in 1910 to 5,337,000 cwt. in 1911. Nearly all of it comes in the form of frozen mutton, chiefly from New Zealand (1,981,467 cwt.), Australia (1,291,696 cwt.), and Argentina (1,782,066 cwt.). The quantity received from Australia and New Zealand was less than in the preceding year, but the receipts from Argentina showed an increase of some 400,000 cwt.

The weight of meat represented by the sheep received alive may be estimated at 25,800 cwt., which added to the imports of fresh and refrigerated mutton make the total receipts 5,363,000 cwt., this being equal to 13¾ lb. per head of the population. In the three previous years the total receipts, alive and dead, were 5,406,000 cwt., 4,766,000 cwt., and 4,434,000 cwt. respectively, or about 13⅓ lb., 12 lb., and 11 lb. per head of the population.

The declared value of the fresh mutton was 50*s.* per cwt., or about the same figure as in 1910 and 1909, and 5*s.* less than the values in the three years 1906–8.

Rabbits.—The receipts of fresh rabbits, chiefly from Belgium, amounted to only 57,808 cwt., and the bulk of the supply was composed of frozen rabbits from Australia and New Zealand, the former country sending 394,155 cwt. and the latter 73,703 cwt. The value per cwt. of these frozen rabbits was, however, only about one-third of the value per cwt. of the fresh Continental supply.

IMPORTS of Live and Dead Meat.

Description.	Quantity.		Value.	
	1910.	1911.	1910.	1911.
	Number.	Number.	£	£
Cattle	219,561	200,397	4,027,918	3,776,404
Sheep	427	47,673	754	74,174
Total live animals ...	—	—	4,028,672	3,850,578
	Cwt.	Cwt.		
Beef, fresh & refrigerated	7,015,498	7,362,434	11,745,146	11,136,223
,, salted	87,636	90,303	173,924	171,072
Mutton, fresh and refrigerated	5,405,923	5,337,451	9,802,858	9,588,646
Pork, fresh & refrigerated	479,907	452,932	1,196,797	1,120,674
,, salted	227,191	236,749	304,168	293,163
Bacon	3,863,389	4,868,738	13,391,274	14,463,414
Hams	719,126	954,811	2,526,595	2,927,610
Meat unenumerated—				
Fresh and refrigerated	707,113	726,072	1,310,759	1,315,430
Salted	70,568	88,357	102,686	123,286
Meat, preserved	742,542	946,180	2,514,039	3,036,967
Rabbits, dead	664,190	525,666	837,122	712,600
Total dead meat ...	19,983,083	21,589,693	43,905,368	44,889,175
Poultry and game ...	—	—	944,907	997,324

Bacon.—The imports of bacon in 1911 (4,868,738 cwt.) show a slight rise compared with the decline which was noticeable in 1909 and 1910. Denmark sent 2,122,087 cwt., as compared with 1,794,416 cwt. in 1910 and 1,809,745 cwt. in 1909; and in these three years the United States sent 1,817,835 cwt., 1,306,921 cwt., and 2,189,053 cwt., and Canada 615,807 cwt., 411,935 cwt., and 443,386 cwt.

pared with 69*s*. 4*d*. in 1910, 59*s*. 8*d*. in 1909, and 50*s*. 11*d*. in 1908.

Poultry and Game.—Poultry is chiefly received from Russia, United States, France, and Austria-Hungary, and the total value in 1910 was £918,197, a somewhat substantial increase over the total of the preceding year (£821,292). The value of the imported game was £79,127.

Total Imports of Meat.—Converting the live animals into their equivalent weight of meat and adding the total imports of dead meat of all kinds (excluding poultry and game), it appears that the quantity available, in addition to the home supply, was some 25,787,000 cwt., as compared with 21,401,000 cwt. in 1910, 21,479,000 cwt. in 1909, 22,205,000 cwt. in 1908, and 22,586,600 cwt. in 1907. This was not entirely consumed in this country as there was a small re-export amounting to 325,595 cwt.

The total value credited to the different kinds of live and dead meat, including poultry and game, was £49,737,000, as compared with £48,879,000 in 1910, £47,623,000 in 1909, £49,448,000 in 1908, £51,888,000 in 1907, and £52,026,000 in 1906.

IMPORTS of Dairy Produce, Margarine, and Eggs.

Description.	Quantity.		Value.	
	1910.	1911.	1910.	1911.
	Cwt.	Cwt.	£	£
Butter	4,325,539	4,302,956	24,493,450	24,602,111
Margarine	1,120,812	944,405	2,935,244	2,461,325
Cheese	2,456,340	2,348,322	6,809,876	7,139,942
Milk, condensed ...	1,009,770	1,155,548	1,755,026	2,021,708
	Great hundreds.	Great hundreds.		
Eggs	18,344,137	19,057,895	7,296,145	7,965,609

Butter.—About seven-tenths of the butter supplied to this country from abroad comes from the Continent of Europe, Denmark (1,707,178 cwt.), Russia (638,284 cwt.), France (171,080 cwt.), Sweden (360,357 cwt.), and Holland (104,655 cwt.) being the chief contributors. Almost the whole of the remainder is received from Australia (874,399 cwt.) and New Zealand (276,446 cwt.).

The quantity of butter received was nearly as large as in 1906, when the maximum amount yet recorded was imported; the value, however, in 1911 was 114*s*. 4*d*. per cwt., as compared with 108*s*. 2*d*. in 1906, so that the total value of the foreign and colonial butter imported in the past year was exceptionally high.

Cheese.—The supply of cheese showed a small decrease. More than half the imports come from Canada, but the supplies from this source decreased from 1,607,064 cwt. in 1910 to 1,473,275 cwt. in 1911. A large increase is noticeable in the receipts from the United States.

Eggs.—Up to 1909 the supply of eggs had been declining for several years, but the increase in 1910 was continued in 1911, the large exports from Russia being principally responsible.

IMPORTS of Grain and Flour.

Description.	Quantity.		Value.	
	1910.	1911.	1910.	1911.
	Cwt.	Cwt.	£	£
Wheat	105,222,638	98,109,087	44,160,884	38,927,680
,, meal and flour ...	9,960,491	10,065,132	5,510,905	5,277,043
Barley	18,281,500	24,504,120	5,396,452	8,248,281
Oats	17,495,014	18,275,937	4,823,869	5,391,970
Oatmeal	775,033	835,985	582,225	598,405
Maize	37,021,192	38,602,330	10,294,340	10,713,183
,, meal	461,624	643,810	158,953	224,415
Peas	1,591,111	2,196,094	718,740	1,012,862
Beans	849,082	1,029,131	311,676	375,345
Other corn and meal ...	13,968,382	12,412,380	5,340.339	4,993,671
Total	205,626,067	206,674,006	77,298,383	75,762,855

Grain and Meal.—The imports of wheat showed a decline compared with the 1910 figures, but were greater than in 1909 or in any previous year. The leading sources of supply were Russia (18,106,100 cwt.), India (20,161,518 cwt.), Canada (14,373,700 cwt.), Argentina (14,748,600 cwt.), United States (12,939,229 cwt.), and Australia (13,910,720 cwt.), the imports of wheat from the last-named being now larger than from the United States, and nearly equal to those from Canada.

an increase from Canada. The exports of flour from this latter country to the United Kingdom are steadily increasing. The declared value of the total imports under this head was less than in 1910, however.

Barley showed an increase as compared with the previous year. The principal contributors were Russia (6,670,400 cwt.), Turkey (3,856,800 cwt.), Roumania (3,980,800 cwt.), and the United States (3,381,400 cwt.).

Oats amounting to 18,275,937 cwt. were imported in 1911, this figure being slightly higher than in 1910 and 1909. Russia (7,217,100 cwt.) and Argentina (5,597,100 cwt.) were the two chief sources of supply. Germany furnished 1,652,000 cwt., and Canada 1,761,100 cwt., while the imports from the United States were insignificant.

The supply of maize (38,602,330 cwt.), although larger than in 1910, did not reach the 1909 total. Compared with 1910 the imports from Roumania and the United States have doubled, and those from Russia have trebled, while Argentina sent about one-fifth of the supply of 1910, so that the trade in this cereal would seem to fluctuate greatly.

Fruit and Vegetables.—Potatoes were received in smaller quantities than has been the case for many years past. The exports of early potatoes from the Channel Islands were affected, the supply having dropped from 1,318,707 cwt. in 1910 to 1,020,901 cwt. in 1911. The receipts from Germany in 1910 and 1911 were 34,302 cwt. and 336,761 cwt. respectively. The other vegetables imported are mainly onions and tomatoes.

With regard to fresh fruit, there was a falling off in the imports of apricots and peaches, lemons, oranges, plums, and strawberries. There was a fairly large increase in the imports of bananas.

Hops were imported to the extent of 169,184 cwt., as against 176,781 cwt. in 1910, but at a very much higher price.

Wool.—As regards wool, the quantity imported differed but slightly from that of the previous year, and the average price remained about the same, viz., $10\frac{1}{4}d.$ per lb., which was the level at which it stood in 1906 and 1907. The bulk of the supply came, as usual, from our own Colonies and Possessions, viz., Australia (323,990,918 lb.), New Zealand

(174,120,629 lb.), British South Africa (101,881,323 lb.), and India (56,595,849 lb.). The total receipts were 795,091,310 lb., as compared with 797,418,403 lb. in 1910.

The re-exports of foreign and Colonial wool were 303,755,000 lb., as against 334,643,000 lb. in 1910, so that the balance of wool (other than home produce) remaining for manufacture in this country was 491,336,000 lb., which was a larger amount than in the five preceding years, viz., 463,929,000 lb. in 1910, 413,326,000 lb. in 1909, 393,594,000 lb. in 1908, and 446,564,000 lb. in 1907.

Soya Beans.—The imports of this article, the residue from which in the form of cake has assumed such importance as a feeding stuff, were 222,657 tons, of which 117,236 tons came from Russia, 102,123 tons from China, 3,278 tons from Japan. The aggregate value was £1,652,283, and the average value per ton about £7 8*s*. 6*d*.

Miscellaneous.—In addition to the agricultural products already mentioned there are some articles of importance which may be referred to as of interest to the agricultural industry. The figures for these are given in the following table :—

MISCELLANEOUS IMPORTS.

Description.	1910.	1911.	1910.	1911.
	cwt.	cwt.	£	£
Wood and Timber	—	—	26,207,329	25,847,077
Tallow and Stearine	2,462,771	2,203,664	4,194,489	3,671,248
Hides :				
Dry	516,896	462,354	1,855,804	1,654,556
Wet	764,155	658,059	2,417,028	2,091,919
Manures :	tons.	tons.		
Basic Slag	16,588	22,266	26,985	37,889
Bones, burnt and unburnt...	44,505	45,876	201,539	226,174
Guano	20,395	34,124	107,958	193,000
Nitrate of Soda	126,498	128,487	1,161,127	1,189,019
Phosphate of Lime and Rock Phosphate... ...	455,593	493,413	722,508	779,706
Oil Seed Cake	317,066	337,425	2,109,604	1,958,309
	cwt.	cwt.		
Seeds, Clover and Grass ...	286,976	233,812	664,170	550,892
Flowers, fresh	—	—	229,798	241,044
	No.	No.		
Horses	14,674	11,528	530,108	435,323

Prices.—Some indication of the range of prices may be gathered from the average declared value of the different

articles, but only to an approximate extent, as an increased importation of a cheaper quality of any article depresses the average value, although no real change in price may have taken place. With this reservation it may be said that the record for the past year shows, on the whole, a decided decrease in the value of meat of all kinds, especially bacon and hams. There were distinct rises in the price of butter, cheese, and eggs. With regard to grain, the value of wheat and wheat flour declined slightly, while barley and oats increased in value. The figures for some of the principal articles are as follows:—

Description.		1908.	1909.	1910.	1911.
		£ s. d.	£ s. d.	£ s. d.	£ s. d.
Cattle	*Head*	17 1 11	17 6 5	18 6 11	18 16 10
Sheep	,,	1 11 1	1 11 10	1 15 4	1 11 1
Beef, fresh & refrigerated	Cwt.	1 16 7	1 13 6	1 13 6	1 10 3
Mutton, ,, ,,	,,	1 17 1	1 12 11	1 16 3	1 15 11
Pork, ,, ,,	,,	2 6 6	2 7 10	2 9 11	2 9 6
Bacon	,,	2 10 11	2 19 8	3 9 4	2 19 5
Hams	,,	2 10 4	2 15 2	3 10 3	3 1 4
Butter	,,	5 14 4	5 10 5	5 13 3	5 14 4
Cheese	,,	2 18 0	2 17 2	2 15 5	3 0 10
Eggs ...	Great hundred	0 7 10¾	0 8 2	0 7 11½	0 8 4
Wool	Lb.	0 0 9¼	0 0 9½	0 0 10¼	0 0 10
Wheat	Cwt.	0 8 4¾	0 9 3	0 8 4¼	0 7 11
,, flour	,,	0 10 11	0 11 6¼	0 11 0¾	0 10 6
Barley	,,	0 6 9¼	0 6 7½	0 5 10¾	0 6 9
Oats	,,	0 5 10	0 6 1¼	0 5 6¼	0 5 11
Maize	,,	0 6 1¾	0 6 2	0 5 6¾	0 5 7

Agricultural Exports in 1911.

The value of the agricultural articles of British production and manufacture exported amounts in the aggregate to a considerable sum, although taken individually they do not usually represent a very extensive trade. The information, available for the past year, is summarised in the next table. The various commodities included under the heading of corn, grain, and flour represent a total of £3,575,908, while meat of all kinds, including live cattle, bacon, hams, poultry, and game, accounts for £1,017,972. Wool from British flocks was exported to the value of £1,631,515, while hides and undressed skins accounted for £1,685,583.

EXPORTS.

Description.		1910.	1911.
		£	£
Grain and flour	...	3,416,637	3,575,908
Meat (including animals for food)...	...	935,958	1,017,972
Wool...	lb.	36,973,300	30,651,700
	£	1,929,245	1,631,515
Hides and undressed skins...	£	1,757,762	1,685,583
Manures	tons	819,966	805,359
	£	4,922,438	5,496,030
Oil-seed cake	tons	175,422	118,665
	£	1,087,183	722,145
Agricultural machinery	...	1,243,991	1,173,675

Description.	Quantity.		Value.	
	1910.	1911.	1910.	1911.
ANIMALS LIVING—FOR BREEDING:	Number.	Number.	£	£
Cattle: To United States of America	1,701	776	39,154	25,324
,, Uruguay	179	19	14,911	2,016
,, Argentine Republic ...	688	243	74,464	20,910
,, Channel Islands	—	—	—	—
,, Australia	99	81	6,394	3,903
,, Canada	212	136	7,361	5,240
,, Other Countries	599	1,351	28,397	43,003
Total... ...	3,478	2,606	170,681	100,396
Sheep and Lambs: To Germany	675	475	5,763	4,286
,, United States of America	1,577	692	9,096	4,326
,, Uruguay	199	111	2,857	1,191
,, Argentine Republic ...	738	422	13,935	9,605
,, Australia	83	72	549	1,262
,, New Zealand	103	96	3,431	1,955
,, Canada	3,811	374	20,609	2,283
,, Other Countries	644	486	6,001	4,753
Total... ...	7,830	2,728	62,241	29,661
Swine: To Argentine Republic ...	13	—	325	—
,, Canada	21	22	163	330
,, Other Countries	825	536	8,652	6,488
Total... ...	859	558	9,140	6,818
HORSES:				
To Netherlands	19,957	20,998	223,578	315,031
,, Belgium	30,206	33,324	390,873	456,981
,, France	2,353	2,993	115,137	142,128
,, Other Countries	6,633	6,880	564,350	549,955
Total... ...	59,149	64,195	1,293,938	1,464,095
ANIMALS OF OTHER KINDS— Not for Food	66,711	91,134	53,529	58,190

Three items of importance, viz., manures, cakes, and agricultural machinery, are included in the table, though they are not agricultural products. In the case of manures, 805,359 tons were sent from these shores, representing a value of £5,496,030; about one-third of this, viz., 291,883 tons, was sulphate of ammonia, while the balance was made up of 159,353 tons of superphosphate, 195,950 tons of basic slag, and 158,173 tons of other kinds of artificial manures.

As regards oil-seed cake, a substantial increase occurred in 1910, but this was not maintained in 1911, when the exports dropped nearly to the figure of 1909.

Perhaps the most interesting item in the export trade, from an agricultural point of view, is that which shows the sales of breeding animals to the Colonies and foreign countries. In the table on p. 843 the particulars are given for the past two years.

The export of cattle showed a marked decrease, owing to the drop in the exports to the United States. The export of sheep was also very much smaller, the decrease in the number sent to Canada and the United States being responsible for this. Horses, however, represent the largest item in this export trade, and the total value in the past year is the largest yet recorded.

Improvement of Indian Wheats for Export.

IN a former issue of the JOURNAL (May, 1911, p. 133), mention was made of the work being done at Pusa with the object of improving Indian wheats. Bulletin 22 of the Indian Agricultural Research Institute, Pusa, gives an account of the further progress that has been made in that direction. The researches of the authors—Mr. and Mrs. Albert Howard—have shown that there exist in India types of wheat nearly as suitable for milling and baking purposes as the well-known Manitoba Hard, which, on an average, is worth, in the home market, about five shillings a quarter more than the best British wheats. The superiority of the Canadian wheat lies in its "strength"—a technical term which means that it produces larger and more shapely loaves than other varieties.

For many years the Indian cultivator—under a mistaken notion as to the requirements of this country—has been growing for export a weak wheat which, except for its remarkable dryness, has very little to recommend it to the miller. That the production of this weak wheat has been largely for export is apparent from the fact, ascertained by Mr. and Mrs. Howard, that for his own consumption the native of India much prefers a strong wheat of the Fife or Canadian type. With a view to providing a higher class wheat for export, the Pusa Institute has, for some years, been engaged in collecting stocks of suitable varieties, both by selection and by the new methods of breeding cereals which are being so successfully pursued at Cambridge by Professor Biffen. It appears from the bulletin under notice that success has been attained, so far at least as a portion of India is concerned. Wheats have been produced which, in the climate of Western Bengal, give not only a much higher yield than the native wheats, but also are characterised by great strength, and are therefore likely to command a higher price in the home markets than the wheats hitherto exported. The new wheats have been examined by one of the leading experts in milling in this country, and pronounced to be practically quite as good as the best Canadian.

An interesting feature of the work at Pusa is that it disproves a theory sometimes maintained by experts, viz., that it is impossible to combine high quality with good yield. It has been known for many years that the high quality Canadian wheats cannot be brought, by any system of cultivation, either in Canada or in Britain, to give as high yields as the low quality wheats commonly grown in Britain, and it is sometimes maintained that low quality is a necessary result of the free yielding power of the favourite British wheats. The work at Pusa, however, confirms what has been established at Cambridge—that it is possible, by the scientific methods of breeding associated with the name of Mendel, to combine high quality with good yield. The results obtained last year with Burgoyne's Fife—a new Cambridge wheat—show that it gives a grain equalling the Canadian in milling quality, combined with the cropping capacity of the best British wheats.

During the progress of their investigations, Mr. and Mrs. Howard made an important discovery in connection with the cultivation of wheat in India that may lead to results of the greatest economic importance. After harvesting his crops in March, the Indian cultivator leaves the stubble untouched during the hot dry months of April and May, when the soil becomes so hard that it is hardly practicable to break it up with the native wooden plough. It is not till July, when the rainy season ordinarily begins, that the cultivator starts to prepare the land for the sowing of wheat in October. It has been found at Pusa that if the stubble be broken up immediately after harvest, and cultivated during the dry months, there is a great accession of fertility. By this means it has been found possible to grow crops of 40 bushels per acre without manure, while the cultivators alongside, pursuing their usual methods, were unable to get more than 15 bushels. It appears that we have here a confirmation of the work recently done at Rothamsted by Messrs. Russell and Hutchinson on the increased fertility that follows partial sterilisation of the soil. Between April and June the temperature of the air in Western Bengal often rises above 100° F., and at the same time the heating effect of the sun on the soil is so great that its temperature goes much beyond that figure. The continual stirring of the soil and its exposure to these high temperatures, therefore, may well give results comparable with sterilisation, and thus produce an increase of fertility similar to that observed by the workers at Rothamsted after sterilisation by artificial means.

The Pusa workers still have problems to face: rust is often the cause of serious loss in India, but it is hoped that by pursuing the methods by which Yellow Rust has been conquered at Cambridge, a wheat will be obtained immune to the disease; by similar methods it may be possible to improve the standing power of the straw, a quality in which the new wheats are capable of improvement.

The valuable results that have followed the application of scientific methods to agricultural problems in India encourage the hope that the establishment of Research Institutes with the aid of the Development Grants will lead to equally

Spraying for Big Bud of Black Currants.

A SMALL experiment was carried out by one of the Board's officers at Harvington, Worcestershire, to test the efficacy of various sprays for combating big bud of black currants. The bushes occupied three-quarters of an acre of ground, but only a small proportion of them were treated. There were two varieties, "Prince of Wales" and "Carter's Champion," all of them affected, the former having an estimated percentage of 60 big buds and the latter of 50.

The bushes were sprayed across the rows so as to eliminate differences solely due to the variety.

Sprays Used.—The sprays used were:—

(1) Lime and sulphur in the dry form at the rate of one part of lime to four of sulphur. Air-slaked lime was used, as ground quicklime in small quantities could not be obtained.

(2) Quassia and soft soap at the rate of 2 lb. of quassia chips, 1 lb. of soft soap, and 10 gallons of water. The quassia chips were boiled for two hours, and then the soft soap was added.

(3) Soft soap alone at the rate of 1 lb. of soft soap to 10 gallons of water.

Plan of the Experiment.—The first three transverse rows were treated with lime and sulphur, the next four were left as control, the next two were sprayed with soft soap, the next four were left as control, and the next 2½ were sprayed with quassia and soft soap. The remaining and larger part of the plantation was left as control.

The two series of intervening control rows were left more to separate any overlapping effects than to act as strict controls.

Dates of Spraying.—On the first spraying, April 20th, the sprays were applied as above. On the second spraying, May 4th, the lime and sulphur was used in the proportion of 1 to 8. On the third spraying, May 25th, pure sulphur was used instead of lime and sulphur.

Results and Notes.—On May 4th immense swarms of mites could be seen outside each big bud. They were also to be found in considerable numbers on the leaves and flowers.

Many living mites were found on the bushes sprayed with quassia and soft soap, though the bushes were sprayed as thoroughly as possible. On May 25th slight scorching was seen on the young leaves of the bushes treated with lime and sulphur. A microscopical examination of big buds from treated bushes and those from control bushes showed but little difference. In each case swarms of mites could be seen at the opening of the buds. Though many of the big buds had dried up there were still plenty from which an active migration was going on.

On June 16th the scorching of the leaves on the "sulphured" bushes was more marked. All the big buds were dried up, but mites were found in the young buds just forming.

On November 4th the plantation was examined as the owner was grubbing the bushes. Sample twigs were taken from the various rows and submitted to microscopical examination. This was necessary, as in November all the buds that contain mites have not yet become "big."

The samples were taken quite indiscriminately, and represented a fair average of the buds. The big buds in each sample were counted with the following results.

	Big Bud.	*Normal Bud.*	*Percentage of Big Bud*
Control	68	102	66·7
Lime and sulphur ...	76	167	45·5
Quassia and soft soap ...	69	135	51·1

The sample from those bushes treated with soft soap only were not counted, as they were obviously no better than the control. Thus the lime and sulphur treatment reduced the amount of disease to two-thirds of the untreated, and the quassia and soft soap to four-fifths.

Occupations of Agricultural Students after leaving College.

Questions are sometimes asked as to the parentage of the agricultural student, and as to what becomes of the student himself. The Board's Report on the Distribution of Grants for Agricultural Education in 1910–11 furnishes some interesting particulars on this point.

The Institutions which are aided by the Board were asked to supply information showing the occupation of the parents

of those pupils who left during the past three years, and the occupation which the pupils themselves now follow. A summary of the returns is given below. The institutions have been arranged in three groups: (1) Agricultural Colleges situated on or near their own farms and providing residential accommodation for a substantial proportion of, or for all, their pupils; (2) University Colleges and other institutions situated in towns and not providing residential accommodation on, or close to, their farms; (3) Farm Schools providing residential accommodation on farms.

Institution.	Total Number of Students Leaving.	Occupation of Parents.			Occupation of Students.		
		Farmers.	Land-owners.	Others.	Farmers.	Land-owners.	Others.
Agricultural Colleges (7) ...	1,064	469	160	435	843	161*	60
University Colleges and other Institutions (5)	384	279	7	98	310	21*	53
Farm Schools (3)	321	221	6	94	294	2	25
Total	1,769	969	173	627	1,447	184*	138

* Include a few teachers, &c.

Of 1,769 pupils for whom full particulars are available, it will be seen that 1,631 are known to have returned to occupations connected with the land, and the great majority are engaged in farming. The "others" number 138, and include a good many who have been lost sight of and may have taken to agriculture. As regards parentage it will be observed that 969 were the sons or daughters of farmers, and a further 173 were connected with the land. It will be remarked that the largest proportion of pupils of non-agricultural origin is to be found in the first group of agricultural colleges shown above, the reason being that residential colleges in the country, with farms attached, are always preferred by non-agriculturists who wish to secure an agricultural training for their children. One College, which would have been included in Group 2 if particulars of the occupations of students had been available, is somewhat exceptional in that the parents of 55 out of 79 pupils were not directly connected with the land.

The Agricultural Department of the University of Cambridge is in a different position from the institutions referred

to above, the students being members of one or other of the Colleges, and their parentage not being known to the Department. The figures supplied by Cambridge have, therefore, not been included in the above returns. In the past three years 231 students have attended the classes provided by the Agricultural Department of this University. Of these 59 are engaged in teaching or research, or are employed in supervising agricultural work in other countries, 26 are landowners or expect to inherit land, 17 are engaged in, or are preparing for, land agency work, 13 are farming. The occupations of the remainder are unknown, but it is probable that many of them expect to inherit land or to become associated with land management.

Preservation of Timber.

The increase in the durability of timber which may be brought about by the use of preservatives is a question of considerable importance in the United States in view of the large annual production of timber in that country, and the subject has engaged the attention of the Forest Service of the Department of Agriculture * since 1902. Although the experiments carried out by the Forest Service were confined to the treatment of poles for telegraph and telephone purposes, many of the results are of interest to the English agriculturist from the point of view of estate management.†

Seasoning of Timber.—The question of seasoning necessarily requires consideration before the use of preservatives is dealt with, since proper seasoning not only prepares timber to receive the preservative treatment, but under certain conditions may be in itself a means of increasing its durability.

Contrary to general opinion, the Forest Service found the shrinkage taking place during the seasoning of poles to be very slight, amounting, in seasoning from green to air-dry condition, to about 0·1 in. or 0·2 in. in the circumference at tbe butt end, and from 0·15 in. to 0·25 in. in the circumference at the top end of poles. The loss in weight during such seasoning was found to be ordinarily from 16 to 30 per cent.

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* U.S. Dep [illegible] Agric., Forest Service, Bull. 84.

† Previous articles on this subject appeared in this *Journal* for May, 1905, p. 77; [illegible]

of the original weight, but in the case of yellow pine of the western United States as much as 49 per cent. was lost during seasoning in from three to nine months.

The rate at which wood seasons was found to depend chiefly on climatic conditions, timber cut during spring and summer becoming seasoned, as a rule, much more rapidly than that cut in autumn or winter. Soaking the timber in water, the degree of exposure to the air, and the method of piling the timber also affect the rate of seasoning. Timber which is seasoned rapidly is much more liable to split than that which is seasoned more slowly. In the latter case numerous small splits are formed, but these close again when the wood absorbs moisture, and apparently no detrimental effect is caused. If, however, the wood seasons rapidly, wide and deep splits may be formed, which do not again close, and which not only decrease the strength of the timber, but materially hasten decay by allowing the entrance of insects and fungi.

Application of Preservative with a Brush.—A very simple method of using a preservative is to apply it to the surface of the wood with a brush, but while experiments carried out in this direction by the Forest Service have given good results, this form of treatment does not present a complete solution to the question of timber preservation. It is especially useful, however, where the erection of even the simplest plant would not be justified, as the cost is very low. Creosote was applied hot to poles of chestnut, cedar, and pine, and the average amount of preservative absorbed in each case is shown in the following table:—

Species.	Absorption per Pole. 1 coat.	2 coats.	Length and Diameter of Pole.	Length Treated.
	lb.	lb.	ft. in.	ft.
Chestnut	2·6	4·7	30 × 7	6*
White cedar (Southern U.S.) ...	—	4·9	30 × 7	6*
,, ,, (Northern U.S.) ...	3·0	4·4	30 × 7	6*
Red ,, (Western U.S.) ...	—	6·5	40 × 8	8†
Yellow pine (,, ,,) ..	2·4	3·6	40 × 8	7†

* Between 2 ft. and 8 feet from butt end.

† From butt end to height indicated.

In these experiments a penetration of from $\frac{1}{8}$ in. to $\frac{1}{4}$ in. was obtained in seasoned timber. With regard to chestnut, it is stated that in some cases failure of treatment was due to the tendency of the thin sapwood to scale off after exposure to weather, and that better results might have been secured if the sapwood had been shaved off for a few feet above and below the ground-line, so that the preservative would be applied to the more firm heartwood. Applications of carbolineum, creolin and tar were also made with a brush, the absorption of tar by 6 ft. of pole being on an average about 7 lb. Care should be taken in this method to fill all splits formed during seasoning; the preservative should not be applied when the surface of the wood is wet or when very cold. In most cases better results will be obtained by heating the preservative before applying.

Treatment by Immersion.—Immersion in a tank filled with preservative has the advantage, in common with the brush method of application, that the butt end only of poles can be treated, and the expense is avoided of applying the preservative to the portion above ground, which in many cases is sufficiently durable without treatment. The treatment consists in subjecting the timber to successive baths of hot and cold preservatives, these latter being thus driven into the wood by atmospheric pressure. Three methods of procedure are possible:—(1) After the timber has been held in the hot preservative for the required length of time, the heating may cease, and without other change the whole be allowed to cool; (2) the timber may be transferred from the hot liquid to another tank containing cooler preservative; and (3) the preservative may be changed, the hot being drawn off and colder preservative run into the treating tank. The hot bath, as a rule, simply prepares the wood for treatment, absorption taking place, except in the case of very dry and porous woods, during cooling.

The length of time during which the wood must be kept under treatment is dependent among other things on the species and condition of the wood. Thus where the sapwood is narrow and the heartwood difficult of penetration, the treatment should be discontinued after the sapwood has been impregnated; and where the sapwood is wide, the period of

treatment must be arranged so as to avoid an unnecessarily large absorption of preservative.

In the case of porous woods a relatively deep penetration is obtained as compared with the quantity of preservative absorbed by shortening the cold bath and removing the wood while the preservative is still fairly hot. Immersion of chestnut in creosote at a temperature of 231° F. for four hours, and subsequently in cold creosote for two hours, gave relatively good results; while in the case of white cedar (Northern U.S.), little advantage was gained by prolonging the hot bath beyond three or four hours. Good results were obtained by treating red cedar (Western U.S.) for two hours with hot creosote and one hour with cold creosote, although in this case longer treatments sometimes gave better results.

As regards the condition of the wood, it was found that the drier the wood the more readily it may be treated. The absorption of preservative by green timber is small and irregular, and the treatment of unseasoned timber is unsatisfactory in addition, on account of the liability of such wood to split in drying, and thus expose untreated wood to decay. Where it is decided to treat wood not thoroughly seasoned, the temperature of the hot bath of preservative should be high, about 215° F. to 230° F. Experiments carried out by the Forest Service on wood which had been soaked in water before seasoning showed that the wood was not rendered any more permeable to preservative by such treatment.

The Forest Service found that the sapwood of nearly all the common species of wood of the United States could be successfully impregnated by the open-tank process; while, on the other hand, the heartwood of many species could only be successfully treated by artificial pressure. The absorption of creosote by poles of various woods was found to be as follows, 6 ft. of the butt end being treated in each case:—

Species.	Absorption per Pole.	Penetration.
	lb.	in.
Chestnut	21·5	0·3
White Cedar (Northern U.S.) ...	48·4	0·5
Red ,, (Western U.S.) ...	39·5	0·8
Yellow Pine (,, ,,) ...	81·4	3·1
Lodgepole Pine	34·0	1·0

Increased Durability as a Result of Treatment.—The results of the tests indicated that an average increased life of at least three years may be expected from applications of preservatives with a brush. The cost of applying two coats of creosote to 6 ft. of pole (including cost of labour) is estimated on the average at about 10*d*., and it is computed, therefore, that if the pole has an increased life of one to two years the cost of treatment is amply repaid.

The application of creosote by the tank method will, it is stated, so preserve the butt end of the pole that the life of the pole will be the life of the top, and no data as regards the life of that part of the pole which is above ground are possessed by the Forest Service, since replacements are commonly made because of the failure of the portion immediately above and below the surface. It is estimated, however, that the life of chestnut is increased by six years, white cedar by eight years, red cedar by ten years, yellow pine by seventeen years, and lodgepole pine by fifteen years. The total cost of treatment with creosote by the tank method of 6 ft. of pole is given as follows:—Chestnut, 3*s*. 3*d*.; white cedar, 4*s*. 4*d*.; yellow pine, 6*s*. 9*d*.; red cedar, 5*s*. 7*d*.; lodgepole pine, 5*s*. 2*d*.; and the annual saving per pole, after deducting cost of treatment, is computed as follows:—Chestnut, 7½*d*.; white cedar, 6*d*.; red cedar, 1*s*. 6*d*.; yellow pine, 9*s*.; lodgepole pine, 4*s*. 1*d*. It will be noticed that preservative treatment pays better where the wood has very little natural durability than where it has naturally a large durability; the use of wood for poles, posts, gates, &c., which would otherwise be unsuitable is thus rendered possible.

Grain Growers' Associations in Canada.

AN interesting and instructive account of the way in which grain growers' interests are protected in Canada is given in the number for October, 1911, of the Bulletin of Economic and Social Intelligence issued by the International Institute of Agriculture.

Seed Branch.—The Seed Branch of the Federal Department of Agriculture was formed in 1902 for the purpose of promoting the use of good seed, and preventing, as far as possible, the sale of impure seed to farmers. The work of

the Branch is carried on throughout the whole of Canada by means of meetings, farmers' conferences, seed shows, and competitions, the co-operation of the provincial Departments of Agriculture being in some cases obtained.

One type of competition, started in Western Canada in 1906, which has become very popular, takes the form of a contest between farmers to see who can grow the best crops from specified seed. The judges are officials of the Seed Branch, or experienced farmers. These competitions have proved of considerable educational value by demonstrating on a large scale the better results which can be obtained by the use of selected seed.

The Canadian Seed Growers' Association.—This is one of the most important organisations of its kind in Canada. It receives a money grant and is also assisted in other ways by the Department of Agriculture. It aims at encouraging, by combined effort, the use and production on Canadian farms of good seed only. Grain grown under the supervision of the Association for a certain time can be registered, either as pure seed or simply as registered seed, an examination of a sample being made in each case.

There are also two important associations in Ontario for the cultivation of cereals for seed, viz., the Ontario Agricultural and Experimental Union and the Ontario Corn Growers' Association.

The Ontario Agricultural and Experimental Union.—This Union was founded in 1880 with the object of keeping past pupils of the Ontario Agricultural College in touch with the staff, and also with the work of the College. In this way the opinions and experience of farmers have been brought to the notice of the staff of the College, while the farmers have been able to benefit by the experiments carried out at the College.

The first combined experiments were carried out by the members of the Union on their own farms in 1886, and many new and improved varieties of cereals, &c., are now cultivated as a result of the work thus begun.

The method adopted is to distribute each spring a scheme of experiments for the year. The tests are usually of a simple character, such as the testing of the productive quality of different varieties of grain, roots, &c. The necessary seed is

supplied free of charge to any farmer undertaking to carry out the test, and to report the results to the Union. The work has been fruitful in increasing a knowledge of the results of agricultural investigations, and in bringing to the notice of farmers new and improved varieties of seed, &c.

The Ontario Corn Growers' Association.—This Association was formed in 1908 to promote better methods of selection and choice of seed among farmers. Its exhibitions are an increasing success, and it aims at making the province produce its own seed instead of using seed from outside sources. The Association has 600 members, who are aiding its work by experiments. It is in receipt of a grant of about £50 per annum.

The Saskatchewan Grain Growers' Association.—The Saskatchewan Grain Growers' Association may be taken as typical of the large grain growers' associations in Saskatchewan, Manitoba, and Alberta. It safeguards growers' interests in every possible way, and encourages or opposes legislative action which appears likely to affect these interests.

The Association consists of local societies with a central executive, and holds an annual general meeting, at which the local societies are represented by delegates. At the meeting in February, 1911, resolutions were passed with regard to insurance against hail, the lowering of railway freight rates and of import duties, and the construction of a railroad to Hudson Bay.

The Grain Growers' Grain Company.—This Company was formed in 1906 by associations of grain growers with a view to obtaining the best possible market for their produce. Its formation was the direct result of an inquiry which was held to investigate the complaints of farmers that they were at the mercy of a small number of buyers backed up by the railways.

The Company is recognised by the Government of Manitoba as a joint stock co-operative society with shares of 25 dollars (about £5); only farmers can be shareholders, and no one can hold more than four shares. Each shareholder has only one vote. It was originally intended to follow the co-operative principle as regards the profit-sharing, but this was objected to as being contrary to the laws under which the Company was

registered. This scheme was therefore abandoned. The number of farmers possessing shares is at present 8,500.

The Company handled in 1906–7 2½ million bushels of grain, and paid a dividend of 8 per cent. In 1909–10 these figures had risen to 16½ millions, and the profit secured was £19,000, out of which a dividend of 15 per cent. was paid, and a sum of £10,000 added to the reserve fund.

The great portion of the corn is sold to exporters in Eastern Canada and in the Eastern United States. The Company has succeeded beyond expectations in securing improved market conditions and obtaining for farmers the best prices possible.

SUMMARY OF AGRICULTURAL EXPERIMENTS.*

FIELD CROPS.

A Russian Method of Corn Cultivation (*Landw. Jahrb., Band XLI., Heft.* 2).—The method of corn cultivation advocated by M. Demtschinsky in Russia was first brought prominently to the notice of German agriculturists in 1908, and since the autumn of that year numerous and extensive experiments have been carried out in various parts of Germany by agricultural schools, chambers of agriculture, and responsible individuals. The experiments were at first carried out exactly on the lines laid down by M. Demtschinsky, but later on modifications were introduced as regards certain details in some cases. It will be remembered† that M. Demtschinsky's plan consists in (*a*) transplanting and deep-setting, or (*b*) deep-setting the plant in the same position, or (*c*) earthing up the plants in the rows.

A report by Dr. A. Einecke, of the Agricultural Chemical Experiment Station at Berlin, is given in the above publication, and contains an account of the experiments which have been carried out in Germany. The results, although differing very much as regards certain points, may be said to be fairly unanimous in condemning transplantation and deep-setting of cereals, principally because no sufficiently increased yield is obtained to compensate for the additional expenditure on wages on account of the increased labour which is necessary. The requisite labour was found to be in marked contrast to that reckoned by M. Demtschinsky. The latter gave 16 to 20 days' labour (one man) as sufficient for one acre, whereas

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* A summary of all reports on agricultural experiments and investigations recently received is given each month. The Board are anxious to obtain for inclusion copies of reports on inquiries, whether carried out by agricultural colleges, societies, or private persons.

† See *Journal*, Dec., 1909, p. 740; Feb., 1911, p. 932; July, 1911, p. 330.

in the experiments under notice the extra labour that had to be employed varied from 53 days in Pomerania to 120 days per acre in Wiesbaden. In one instance the transplantation and deep-setting could not very well be carried out on account of the heavy soil. In Posen, the dry weather which is usually prevalent in May and June was held to render the transplantation of spring cereals impossible. The longer period of vegetation under M. Demtschinsky's system would not render the system advisable in unfavourable climates.

As regards the effect of earthing up the plants in the rows, the results seem to have been extremely favourable in most cases to the development of the plants, and the latter are usually prevented by this method from being "laid" by bad weather. Little extra labour would seem to be involved, a special machine being used for sowing.

The effect on the various cereals may be noticed. The results, both of earthing up and transplanting, were favourable on winter rye on sandy and clay soils; winter wheat in general was much less favourably influenced than rye. Experiments on spring rye did not meet with success. Earthing up and transplanting were attended with good results in two experiments on spring barley. The effect on oats varied so much that no definite statement is possible.

There is no doubt that as regards individual plants the results of the Demtschinsky method of cultivation are extremely favourable. The ears are longer and the production of grain per plant greater than from ordinary methods of cultivation.

A point which has not been decided in these experiments is as to whether dibbling would not on strong soils give as good results as the methods of transplanting and deep-setting advocated. Further, although this Russian system cannot be said to have been a success financially, it has drawn the attention of German agriculturists to the possible value of deeper ploughing, and sowing the seed earlier, farther apart, and in smaller quantity. The system may also be of use from the point of view of plant breeding.

The same publication contains an account of another series of experiments which were carried out in the experimental fields of the Royal Würtemberg Agricultural High School at Hohenheim in 1908–9 on rye, and in 1909–10 on wheat, rye, barley, and oats. The results may be summarised as follows:—

The Demtschinsky method caused an extraordinarily good development of the plants, and this is to be ascribed principally to the thin seeding. The development was greatest in the case of winter barley, with winter rye and winter wheat next in order, and smallest in the case of spring barley.

The ripening of the corn was delayed from 3 to 10 days, but earthing up and deep-setting led to greater uniformity in the development of the plants and in the ripeness of the grain.

Where the seeds and plants suffered from pests (*e.g.*, snails, frit-fly, &c.) the damage was greater where the Demtschinsky method was employed than where the ordinary method of cultivation was followed. The former system was very effective in preventing the corn being "laid" by bad weather.

Earthing up, transplanting, and deep-setting caused a very large

increase in the yield of corn and straw from the individual plant as compared with the yield from ordinary methods of cultivation, especially in the case of winter barley. There was no noticeable difference in the increases brought about by each of these three methods (viz., thin seeding, transplanting, and earthing up) separately.

As regards yield per acre, it may be said that earthing up and transplanting decreased the yield per acre, but increased the size and weight of individual grains.

It is concluded that transplanting cannot be undertaken by practical agriculturists on account of the large amount of labour necessary. Earthing up is perhaps practicable on a large scale, but leads to no higher yields than ordinary methods.

Experiments were carried out at the same time in regard to another system of cultivation which has also attracted attention in Germany. This is known as the Zehetmayr system, and appears to consist in drilling the seed in a special way. Briefly no very great practical advantages were found to result from this system in these experiments over and above those obtained from good ordinary cultivation.

Varieties of Oats (*Bedfordshire C.C. Agric. Educ. Com., Rept. on Wheat and Oat Plots*, 1911).—The following varieties of oats gave the heaviest crops :—

	Five years previous to 1911. Bush.	1911. Bush.
White Horse (Webb) ...	48	46
Waverley (Garton)... ...	44	43
Abundance (Garton) ...	43	50
Newmarket (Webb) ...	41	51
Record (Garton) ...	...Not grown	50

Newmarket and Abundance, which were better than the others in quality and weight, are considered to be well adapted for a general crop. The proportion of grain and husk was ascertained, and a high percentage of grain was found usually to accompany high weight.

LIVE STOCK AND FEEDING STUFFS.

Cattle Feeding (*Jour. of the Dept. of Agric. and Tech. Instruction for Ireland, October*, 1911).—Imported feeding stuffs were compared with home-grown foods for cattle. The experiment was carried out at two centres; at the first, two lots each of seven cattle were used for ten weeks, and at the second centre two lots each of ten cattle were tested for eight weeks. One lot at each centre was fed on a mixture of imported foods consisting of one part (by weight) of maize and two parts of undecorticated cotton cake, and the second lot was given a mixture of home-grown foods consisting of one part of wheatmeal, one and a half parts of barley meal, and two parts of ground oats. At the beginning of the experiment the animals received 3 lb. per head daily of the concentrated foods; this was later increased to 4 lb., and finally to 5 lb. The cattle were also put out to pasture.

The total live weight increase was 27 cwt. from the 17 animals fed on imported foods, and 24¾ cwt. from the 17 animals fed on home-grown foods. Reckoning the increases at 33*s*. per cwt., the profit

from the imported feeding stuffs over the home-grown foods works out at £3 11*s*. 7*d*. To this amount, however, must be added the difference in the cost of the foods (imported foods cost £10 13*s*. 4*d*. and home-grown £13 16*s*. 3*d*.), and the greater manurial value of the cotton cake and maize.

DAIRYING.

Churnability of Cream (*Jour. Agric. Sci., Vol. iv., Pt. 2, October, 1911*).—In an article, by Messrs. Cooper, Nuttall, and Freak, of the Cooper Research Laboratory, dealing with the fat globules of milk, a number of investigations are described which were undertaken with the object of explaining the variations in the behaviour of cream in churning. It appears that the cream of various breeds—and even the cream of individual cows—shows a persistent difference in behaviour as regards the time required for churning and the amount of fat recovered in the form of butter. It appears that cream in which the average size of the globules is large gives the best results for butter making, whereas for cheese making the smaller globules give better results. The authors describe the ingenious apparatus they have devised for carrying out these investigations on the "churnability" of milk. They are unable to announce a solution of the various problems to which the subject gives rise, but it is hoped that a more extended series of experiments will yield valuable results.

WEEDS AND PLANT PESTS.

Tumour and Canker in Potatoes (*Jour. Roy. Hort. Soc., December, 1911*).—This article, by Mr. A. S. Horne, B.Sc., F.G.S., gives the history of *Chrysophlyctis endobiotica* and *Spongospora solani*, together with an account of the symptoms of the two diseases. With regard to the latter an experiment at Durham is described in which the seed was derived from several different known sources, and the potatoes planted in the experimental rows were carefully selected. The crop was found to be uniformly infected, and it is contended that it is extremely improbable that the disease in this case was introduced by infected seed. The addition of lime to the soil brought about an increase in the amount of disease. It is concluded from the experiment at Durham and from some experiments carried out near Edinburgh and in Aberdeenshire, that *Spongospora* may be present in the soil of a particular field or farm, but the disease may not manifest itself to any extent.

DISEASES OF ANIMALS.

Loss of Efficiency in Arsenic Dipping Fluids (*Jour. Agric. Sci., Vol. iv., Pt. 2, October, 1911*).—A paper dealing with the loss of efficiency observed in certain alkaline arsenite dipping fluids is contributed from the Cooper Research Laboratory. In certain warm climates, where, owing to the prevalence of tick-borne diseases, it is necessary to dip cattle periodically, the fluid used contains sodium arsenite as its principal ingredient, and under the influence of the other ingredients an oxidation of the arsenite sets in which results after a time in the bath losing its efficiency.

The authors have succeeded in proving that this oxidation is mainly due to the presence of tar products in the bath, and that wood tar (*e.g.*, Stockholm tar) in particular favours rapid oxidation.

This result, it is suggested, points to the need of periodic offici^al analysis in all countries where dipping of cattle is enforced by law.

Tuberculosis in Cattle (*Census and Statistics Monthly, Octobe* 1911).—Practical open-air experiments, which lasted from Decembe 1905, to February, 1909, were carried out under the direction of t Veterinary Director-General of the Canadian Department of Agric ture. The objects of the experiments were three: first, to ascerta the effect of open-air treatment on the diseased cattle themselve secondly, to ascertain to what extent healthy cattle kept in contact wi diseased cattle under open-air conditions were subject to infection; an thirdly, to ascertain what percentage of healthy calves it was possib to rear from diseased cows kept without any precautions under ope air conditions. The original herd under experiment at Ottawa co sisted of 43 animals, but some were slaughtered and additions we made, which, it is admitted, rather detracted from the value of t experiments. Altogether 52 calves entered into the experiments, a of these 29 escaped infection, 21 contracted tuberculosis, and two cas were doubtful. Approximately the proportions were 60 per cer healthy and 40 per cent. diseased. The proportion of healthy calve viz., 60 per cent., is at first sight, according to Dr. Rutherford, som what discouraging; but when it is remembered that with one exceptic all the cows on which they were reared were affected with tuberculosi that one had a tuberculous udder, and that a number of othe were open and clinical cases, the matter assumes a somewhat differe aspect. It is highly improbable, he thinks, that such a large pe centage of healthy calves could have been obtained from a herd the same kind under ordinary stable conditions. He states furth that the data obtained indicate that open-air life is highly benefici to tuberculous cattle, and that the danger of transmission to adu cattle kept in contact under these conditions is relatively slight, whils on the other hand, the percentage of healthy calves raised by tl diseased cows is, as was to be expected, relatively small.

HORTICULTURE.

Pollination of Apples (*Jour. Roy. Hort. Soc., December,* 1911).— being accepted that many varieties of apples require pollen fro flowers of another variety in order to produce fruit, it becomes importance to know the time of flowering of different varieties, sin the chances of successful pollination will be greater if varieties flowe ing at the same time are intermixed.

This article gives the results of observations taken at the Roy Horticultural Society's Garden at Wisley as to the average order flowering of varieties of apples in the four years 1908–11. Th earliest date of full bloom of the earliest variety (Red Astrachan) Wisley was April 21st., and the latest date of full bloom of tl latest variety (Royal Jubilee) was May 23rd, and the period of fu bloom varied from 18 to 35 days. The dates of flowering of a fe of the varieties may be given for purposes of comparison. The numb

of days that elapsed between the flowering of Red Astrachan (the earliest) and Early Peach was 4⅝ days; Duchess of Oldenburgh, 5⅜ days; Keswick Codlin, 5¾ days; Stirling Castle, 6¼ days; Early Rivers, 7¼ days; Lord Suffield and Ribston Pippin, 8 days; Cox's Orange Pippin and Lord Grosvenor, 10⅝ days; Duke of Devonshire, Early Victoria, and Beauty of Bath, 10¾ days; Worcester Pearmain and Lord Derby, 11¾ days; Ecklinville Seedling, 11⅞ days; Lane's Prince Albert, 13½ days; Potts's Seedling, 14⅛ days; Bramley's Seedling, 14⅜ days; Cox's Pomona, 14¾ days; Mr. Gladstone, 15 days; Thomas Rivers, 15¼ days; Surprise, 16⅞ days; Sandringham, 17¾ days; and Royal Jubilee, 18⅞ days.

The results at Wisley are compared with results obtained at Sawbridgeworth, Woburn, Wye, Herefordshire, Victoria (Australia), and at stations in the United States, and it is evident that apples retain their characteristic earlier or later flowering propensities regardless of differences of locality.

MISCELLANEOUS EXPERIMENTS.

Electrical Treatment of Crops (*Leaflet, Miss E. C. Dudgeon, Lincluden House, Dumfries*).—The following is a brief account of some experiments carried out by Miss E. C. Dudgeon in 1911 on the growth of potatoes with electric treatment, by means of the Lodge-Newman high-tension electric discharge apparatus. The field used was one on the farm of Lincluden Mains, near Dumfries, tenanted by Mr. Cameron, and the portion reserved for experimental purposes was about 8 acres, which, from the date of ploughing till the planting of the seed tubers, was treated all over in precisely the same manner. The land was practically level, having only one or two slight undulations; the soil varied slightly, some portions being loamy, while others were gravelly, but as these inequalities were distributed over the whole field, care was taken in dividing the plots to include equal portions of each variety in both experimental and control areas.

The field was ploughed in February, after which it was given a dressing of 6 cwt. to the acre of a special potato manure, and at the time of putting in the seed tubers, about 25 cart loads of farmyard manure per acre were spread between the drills.

Owing to a spell of wet weather it was not possible to commence planting till the third week in April, and for the first week after planting had been completed rain fell for several days. From May 4th to June 15th the weather was bright and dry; after that date rain fell for several days, when dry weather again set in and continued up to the date of lifting the crops.

The electric discharge was applied daily from May 1st till August 18th, averaging during that time four hours per day. The hours for putting on the discharge were regulated by weather conditions—on dull days it was applied both morning and afternoon; when it was warm, with bright sunshine, for two, three, or four hours in the evening. The discharge was applied for a total of 413 hours.

The varieties of potatoes planted were Ringleader, Windsor Castle, Golden Wonder, and Great Scot.

Owing to applying too late for seed tubers of the Ringleader, which

variety Miss Dudgeon was anxious to have for trial, she was only able to obtain the third-grade size, which in many cases were little larger than an ordinary marble.

From the commencement of the application of the discharge a distinct difference was observed between the two plots, the crops under the electrified wires being, from the commencement of growth up to the time of ripening, distinctly in advance of those outside the influence of the charged wires. The tubers were ready for lifting quite a week earlier; also the greater height of the haulms and luxuriance of leaf-growth were very marked.

The following table gives the weights per acre of the crops lifted in the electrified and control plots:—

	Not electrified.		Electrified.		Increase.	
	tons	cwt.	tons	cwt.	tons	cwt.
Ringleader	5	17	8	1	2	4
Windsor Castle	9	18	11	15	1	17
Golden Wonder	8	2	8	15		13
Great Scot	10	6	11	16	1	10

The cost of applying the electric discharge was £5 19*s*. 6*d*., comprising petrol, £1 6*s*.; lubricating oil, 6*s*.; and depreciation at 10 per cent. on apparatus (costing £175) for three months, £4 7*s*. 6*d*. The same expense would, however, have covered the cost of electrifying an area of 15 acres instead of the 8 acres treated in the experiment.

Utilisation of Atmospheric Electricity in Plant Cultivation (*Jour. d'Agric. Pratique, September 29th*, 1910).—An apparatus which has been used during a number of years at Angers for fixing atmospheric electricity with very good results is described in this publication, and the results obtained with a number of crops are given.

Experimental Error in Field Trials (*Jour. of Agric. Science, Vol. IV., Part 2, October*, 1911).—The question of the experimental error in agricultural investigations continues to attract attention. It was discussed at some length by some of the leading research workers in the Supplement to the December issue of this *Journal*, and the matter is carried to a higher stage of refinement in an article by Messrs. Hall and Mercer in the above periodical. An analysis of the sources of variation in field experiments shows that they may be divided into two categories:—(*a*) Variation in the climatic or seasonal conditions under which the experiments are made; (*b*) the natural fluctuation of the plant under observation under the influences of casual environmental conditions, such as small differences of soil, situation, or cultural treatment. The first varies from year to year, while the second may affect crops growing in the same field under the same seasonal conditions. The authors lay down that the limits of the error due to the first class cannot be evaluated on the assumption that they obey any law, but they show, on a consideration of experiments carried out at Rothamsted, that errors of the second class obey a definite law, and, consequently, can be predicted. They are of opinion that errors of the latter class can be best evaded by scattering the plots receiving the same treatment about the area under experiment, and as a suitable system they recommend that each unit of comparison

(*i.e.*, each plot of the same variety, or each plot receiving the same manurial treatment, &c.) should consist of *five* sub-plots, each of one-fortieth of an acre, systematically distributed over the area under observation.

Destruction of Field Mice (*Praktische Blätter für Pflanzenbau und Pflanzenschutz, September–October,* 1911).—An account has already been given in this *Journal* (January, 1911, p. 861) of the havoc wrought by a serious plague of field mice which occurred in Bavaria in 1910. A report by the Royal Agricultural and Botanical Institute at Münich urges upon agriculturists the necessity of taking active measures against mice before the plague becomes so serious as to render the success of remedial measures doubtful.

The experience gained in combating the plague in 1910 went to show that all the methods adopted have their advantages and disadvantages, and that conditions which are favourable to the employment of one method are unsuitable for the employment of another.

With regard to preventive measures, the best method recommended for general use against field mice is fumigation with carbon bisulphide. Old pieces of sacking should be dipped in the liquid and pushed as far as possible into the burrow with a stick, and the gas given off asphyxiates the mice. A method, however, that does the work more economically, quickly, and completely, besides eliminating all danger to the operator, is to use an apparatus specially invented for the purpose and sold throughout Germany. Where carbon bisulphide is employed without apparatus, great care has to be exercised on account of its inflammability, and it must be stored so that the proximity of any burning or smouldering material is impossible.

An older method than the above consists in laying poisons in drains or in wooden boxes open at the sides, covered with straw, and placed in the fields. The renewal of the poison from time to time prevents any increase in the numbers of field mice.

The foregoing preventive measures can be carried out by the individual, but when an extensive plague of field mice occurs, combined action only can be expected to meet with success. Rat poisons and viruses seem to be preferred where combined action is necessary, especially the former, on account of their simplicity and the rapidity with which they take effect. Apart from their dearness, however, all poisons have the disadvantage that they are liable to be eaten by animals other than mice, and care must therefore be taken that domestic animals, or wild animals which destroy mice, do not get at the poison. Corn poisoned with strychnine is mostly used, but phosphorus is also often employed. In the latter case straws are smeared with the preparation and thrust into the burrows. The mice in passing out rub against the straw and die through licking the poison from their bodies. Barium salts, especially barium carbonate, have proved very effective, and have the additional merit of being cheap.

Rat virus is recommended where measures are to be adopted on a large scale for the destruction of field mice. The most favourable time to use the virus is in the early spring, as the mice are then least resistant to the bacilli, and in the absence of other food are compelled to eat that which has been treated with the virus. Virus

may be used also in late autumn, from the middle of October onwards. The laying of the poison or virus should take place preferably in early morning or in the evening, and in fine weather. Rainy weather *injures the effectiveness of the materials.*

FORESTRY.

Experiments with Scots Pine Seed from Various Sources (*Prof. W. Somerville, Quarterly Jour. of Forestry, October,* 1911).—In 1907 Prof. Somerville started a small experiment with Scots pines to test the influence of the latitude and elevation at which the seed was gathered. Samples of 100 seeds gathered in different countries and situations were sown in pots at Oxford on May 10th, and the results examined after intervals of one, three, and twenty-two months from sowing. After being measured and weighed the seedlings were put out in nursery lines and left till they were four years old. In the following table are shown the number of seeds out of each 100 which had germinated a month after sowing, and the number of seedlings surviving at four years, with their heights and weights.

District where Seed was Gathered.		Percentage Germination after 1 month.	Seedlings four years old.		
			Number.	Average Height.	Weight per 100.
				In.	Lb.
1. Switzerland	5,600 ft.	10	4	3·2	0·93
2. „	4,600 „	15	15	7·1	6·66
3. „	1,250 „	70	34	8·0	8·55
4. Alsace	430 „	69	29	7·5	5·71
5. East Prussia ..	Lat. 54°	50	17	5·4	2·94
6. Central France ...	Lat. 45°	55	15	4·0	2·50
7. Southern Sweden...	Lat. 57°	54	15	6·6	5·62
8. Northern „ ...	Lat. 62°	38	13	2·5	0·84
9. Brodie, Scotland...	100 ft.	11	2	2·0	0·22
10. Switzerland	5,780 „	13	All died off in the first winter.		
11. „	2,650 „	48			

It will be seen that Nos. 3, 4, 5, and 7 gave very much better results than some of the others. The experiment was not designed to show the best sources from which British planters may draw supplies of seed or seedlings, for seed which suits one locality may be quite unsuitable for another. It is clear, however, that the suitability of the origin of seed for planting in any particular locality has an enormous influence upon the fate of silvicultural operations, and that much more information upon the subject is required.

Dr. Somerville points out that if a landowner, desiring to establish plantations of Scots pine under such conditions as prevail at Oxford, had happened to lay in a stock of the seed which had been gathered at a high elevation in Switzerland, or from a high latitude in Sweden, or from a low elevation in the north-east of Scotland, he would probably have obtained results that must have absolutely prevented success in his operations.

OFFICIAL NOTICES AND CIRCULARS.

The Board have issued the following circular letter, dated December 7th, 1911, to Local Authorities in Great Britain under the Diseases of Animals Acts, 1894 to 1911:—

Anthrax. Reports as to Samples sent for Examination.

SIR,—I am directed by the Board of Agriculture and Fisheries to advert to their Circular Letter (No. A $\frac{19C}{C}$) of September 24th, 1910, as to the Anthrax Order of 1910, and to acquaint you, for the information of your Local Authority, that in connection with the examination at the Board's Laboratory of samples forwarded there in pursuance of Article 5 (4) of the Order, it is found to be desirable that the reports as to such samples should also be sent by the Veterinary Inspector, or Veterinary Surgeon employed by the Local Authority, direct to the Laboratory, instead of to this office as indicated in the footnote to the specimen form of Report in Appendix III. to the Circular Letter above referred to. The Board would be obliged, therefore, if your Local Authority would be so good as to arrange accordingly.

The reports should be addressed to—

THE CHIEF VETERINARY OFFICER,
Laboratory of the Board of Agriculture and Fisheries,
Alperton Lodge,
Wembley, Middlesex.

The postage of communications addressed to the Laboratory must, in order to comply with the Postal Regulations, be prepaid by the sender.

I am, &c.,
T. H. ELLIOTT,
Secretary.

Recent Leaflets.

The Board have recently published the following new leaflets:—No. 241, The Construction of Cow Houses; No. 251, Common Weeds—I.; No. 254, The Composition of Seaweed and its Use as Manure; No. 255, The Workmen's Compensation Act, 1906; No. 257, The International Agricultural Institute: Its Objects and its Publications; and No. 259, Swift Moths.

New editions of the following leaflets have been issued, the information in a number of them having been revised:—

No. 7.—*Autumn Catch Crops and Fodder Supply.*
No. 42.—*The Short-Eared Owl.*
No. 50.—*Water Wagtails, or "Dish-washers."*
No. 57.—*External Parasites of Poultry.*
No. 80.—*The Use of Artificial Manures.*
No. 105.—*Wart Disease (Black Scab) of Potatoes.*
No. 143.—*The Turnip Mud-Beetle.*
No. 177.—*Precautions against Accidents caused by Farm Machinery.*—Information with regard to the prevention of boiler explosions has now been included.

No. 205.—*The Apple Sawfly.*
No. 226.—*Broom-Rape.*—An improved illustration is given.

Results of Service Seasons of Thoroughbred Stallions awarded King's Premiums.

The Board of Agriculture and Fisheries desire to make public the results of the Service Seasons of the thoroughbred stallions to which King's Premiums were awarded by the Board in March last. The total number of mares served by the fifty stallions was 3,245, an average of 65 mares a stallion. The average payment by the Board to the owner of a King's Premium Stallion was £177, and the maximum payment £224. In addition, the stallion owner is entitled to receive from mare owners £2 for each mare served, and will also receive from the Board 12*s.* 6*d.* for each foal dropped. The total earnings of a King's Premium Stallion for an average season will amount approximately to £300, and for an exceptionally good season to £400.

MISCELLANEOUS NOTES.

Importation Regulations.

Importation of Animals, Fodder, and Some Animal Products into Australia.—The importation of animals, &c., into the Commonwealth of Australia is governed by the Quarantine Act of 1908. Provisional regulations under the Act have been recently issued (Statutory Rules, 1911, No. 121). The following is a summary of the provisions as far as animals imported from the United Kingdom are concerned.

Not less than seven days' notice of the arrival of any animal must be given by the importer to the Chief Quarantine Officer of the State.

The following declarations, &c., must be forwarded with the animals by the owner or consignor of any imported animals, whether horses, asses, mules, cattle, sheep, goats, swine, or dogs, and must be delivered to the Chief Quarantine Officer prior to the landing of the animals :—

(1) A declaration from the owner certifying—

(*a*) That the animal has been free from disease during the six months next preceding shipment, and, in the case of *dogs*, that the animal has been located in the country during these six months.

(*b*) That it has not been in contact with any animal suffering from disease during the six months next preceding shipment.

(*c*) In the case of *any horse, ass*, or *mule*, that it has *not*, except as required under (2), been tested with mallein during the thirty days next preceding shipment; in the case of *cattle* that it has not, except as required under (2), been tested with tuberculin during the two months next preceding shipment; in the case of any *sheep* or *goat* that it has been dipped by thorough immersion in an effective scab-destroying preparation within the fourteen days next preceding shipment (the exact nature of the dipping preparation used must be stated in the declaration).

(2) A certificate by a qualified veterinary surgeon as to a mallein

case of *cattle*. The certificate must, *inter alia*, state the date on which the test was applied.

(3) A certificate of general health from an approved veterinary surgeon at the port of shipment, who, in the case of horses, asses, mules, and cattle, must, unless he himself has applied the mallein or tuberculin test, also endorse the mallein or tuberculin test certificate to the effect that after due inquiry he has no reason to doubt its correctness. In the case of sheep, goats, and dogs the veterinary surgeon at the port of shipment must endorse the owner's declaration to the effect that after due inquiry he has no reason to doubt its correctness.

Cattle and Sheep for Slaughter.—In the case of cattle and sheep imported for immediate slaughter a certificate from a Government veterinary inspector of the country of origin is required to the effect that the animals have been inspected immediately prior to shipment, and are free from disease.

Animals for Scientific or Exhibition Purposes.—Notice of intention to introduce wild or undomesticated animals for scientific or exhibition purposes into a State must be given to the Chief Quarantine Officer of the State, and a permit to introduce must be obtained. The permit must be handed to the master of the ship prior to the embarkation of the animal, and delivered by him to the Quarantine Officer at the port of entry. The notice and permit may be given by cablegram. In addition, a declaration is required as under 1 (*a*) and 1 (*b*) above, which must also set forth the location and environment of the animal during the six months next preceding shipment. A certificate from an approved veterinary surgeon at the port of shipment is also required.

Performing Animals.—In the case of circus or other performing animals of the several kinds permitted to be imported, the declarations, certificates, notices, and permits are those required in respect to the same kind of animal generally.

Quarantine.—The period of quarantine, which is passed at a quarantine station, dating from the time of removal from the vessel, is 14 days for *horses, asses*, and *mules*, 40 days for *cattle*, 14 days for *swine*, 30 days for *sheep* and *goats*, 60 days for *dogs*, and 90 days for *wild and undomesticated animals*. Examination and treatment in quarantine is to be as the Chief Quarantine Officer directs. It will include the mallein test for horses, asses, and mules, and the tuberculin test for cattle. Sheep and goats may be sheared and will be dipped at least twice. No release from quarantine will be issued until the animals have been certified to be in good health. Charges are made for the maintenance, examination, and treatment of animals in quarantine, and must be defrayed by the owner or consignee, who may be required to make a deposit, varying according to the animal, with the Chief Quarantine Officer.

Fodder.—The importation of fodder is subject to the permission of the Minister of Agriculture, and to the conditions (1) that the importer is to give not less than two days' notice of arrival of the fodder, and (2) that the fodder is to be landed in quarantine at an approved place, and treated as prescribed or as directed by the Chief

hide or skin a declaration made in the country of origin before a magistrate to the effect that such hide or skin was not derived from any animal which had suffered from or died from anthrax or similar disease, and that it has been effectively dry salted, wet salted, or arsenically dressed. This declaration must be certified to by a Government officer of the country of origin, to the effect that to the best of his knowledge the declaration is true and correct.

Hides and skins are not allowed to be landed without a permit, and on receipt of the permit they must be removed to an approved *tannery or other approved place for treatment as prescribed or as* directed by the Chief Quarantine Officer.

Wool and Hair.—Notice of intention to import must be given by the importer, and the permit of the Minister of Agriculture obtained. On landing the wool and hair is to be removed to a quarantine station for treatment as prescribed or as directed by the Chief Quarantine Officer.

Bones and Animal Manure.—The regulations provide for notice of arrival being given by the importer and for treatment in quarantine. Bones may only be imported through Sydney, Melbourne, Geelong, Brisbane, Rockhampton, Townsville, Port Adelaide, Fremantle, and Hobart.

Importation of Live Stock into Ceylon.—Regulations of October 7th, 1911, issued under the Contagious Disease (Animals) Ordinance of 1909, provide that every person importing horses, asses, or mules into the island from oversea ports shall, wherever possible, give to the principal officer of Customs at least 24 hours' notice of the arrival of such animals, and shall produce a certificate of inspection by a qualified veterinary surgeon describing such animals and certifying that they were free from disease immediately before shipment.

Upon receipt of the above notice, the principal officer of Customs shall cause such animals to be inspected by a duly authorised veterinary Inspector, who shall report to the Customs the official result of his inspection, or in his discretion he may authorise the discharge of the said animals from the ship.

No animals may be discharged from the ship without the authority of the Inspector or be removed from the Customs' premises without the *permission of the principal officer of Customs. (Board of Trade Journal,* November 16th, 1911.)

Importation of Seeds into Newfoundland.—Act No. 19 of 1911 provides that no person may import, for the purpose of sale, any seeds of cereals, grasses, clovers, forage plants, field roots, or garden vegetable crops without first obtaining a licence for such purpose.

Such licences may be granted by the Minister of Agriculture and Mines to such persons as shall have received the requisite certificate of the Inspector appointed under the Act, entitling the holder thereof to import for sale seeds of all kinds. Such licences shall be in force for one year from the date thereof, and may be issued at any time.

The Act is *not* applicable to seeds imported by persons for their own use and not for sale, or by agricultural societies for distribution among the members thereof, or to any seed which may be imported

of timothy, red clover, or alfalfa, or forty of them per ounce of alsike seed, and not more than two hundred seeds of all kinds of weeds per ounce of the seed. Grade No. 3 must mean that the seeds contain not more than eighty seeds of noxious weeds per ounce of timothy, red clover, or alfalfa, or one hundred and sixty of them per ounce of alsike seed, and not more than four hundred seeds of all kinds of weeds per ounce of the seed. The sale of seeds, for seeding purposes, of timothy, alsike, red clover, or alfalfa containing a greater proportion of impurities than that specified for Grade No. 3 is prohibited.

The sale, for seeding purposes, of seeds of cereals, flax, grasses, clovers, forage plants, field roots, or garden vegetable crops, which are not capable of germinating in the proportion of two-thirds of the percentage standard of vitality for good seed of the kind is prohibited unless every package, &c., containing such seed, or a label securely attached thereto is plainly and indelibly marked with the name of the kind of seed, and the percentage of the seeds that are capable of germination.

The sale of "papered seeds," *i.e.*, sealed packets of garden seeds, including both vegetable and flower seeds, is prohibited unless the same are marked with the year in which the packet was filled, and such seeds must not be afterwards used to mix with any other seeds that may be offered for sale for seeding.

Budget of the French Ministry of Agriculture, 1911.—The amount provided for Agriculture in the French Budget of 1911 is £2,151,247, or £164,900 more than in 1910. The main items are:—

	£
Salary of Minister and staff	47,040
Grants in aid to farmers and subventions to agriculture	121,000
Bounties given for the cultivation of—	
Silkworms	200,000
Olives	80,000
Hemp	91,000
Indemnities for the destruction of diseased animals ...	64,000
Stud farms	277,125
Encouragement of horse breeding	53,040
Preservation of forests, dunes, watercourses, and hill land	190,140
Employés in State forests, &c.	230,080

The bounty of £80,000 for the cultivation of olives is a new item this year. (*F.O. Repts., Annual Series,* No. 4806.)

Proposals for the Destruction of the Warble Fly in Germany.—Various estimates have been made of the damage caused in Germany by the Warble Fly, and the loss to tanners and butchers alone has been placed at £300,000 to £400,000 per annum. In an article by Dr. Karl Möller,* President of the German Union of Tanners, it is stated that the general public suffers more than either the farmer, tanner, or butcher, as, on account of the dearness of leather, damaged pieces are not thrown away, but the defects are concealed for the time being, to reappear after the boots, shoes, saddlery, &c., into which the leather has been manufactured, have been subjected to a little wear.

lack of fodder in many parts of the Bombay Deccan. Even in an ordinary year fodder in these districts is so scarce that hardly any is stored. In other parts it is usually plentiful, but its bulk prevents transportation, and it therefore appears that a good opening exists for compressed fodder that is easily portable, and can be kept for a long time.

Prevention of Adulteration of Fertilisers in Russia.—A Bill for the prevention of the adulteration of artificial manures in Russia, which is at present under consideration, proposes to prohibit the sale of manure containing less than a given percentage of its proper constituents or more than a certain percentage of impurities. The Bill also provides for the establishment of experimental stations and laboratories in various districts for the purpose of testing fertilisers. (*Board of Trade Journal*, December 14th, 1911.)

Demand for Chemical Manures in Egypt.—H.M. Consul at Alexandria (Mr. E. H. Mulock) reports that in 1910 there was an increase in the imports of chemical manures, due to their increasing demand for intensive cultivation, chiefly of agricultural crops, and to some extent (in Alexandria only) of vegetables and fruit. A total of 35,559 tons was imported into Egypt in 1910, of which 50 per cent. came from Belgium, 33 per cent. from Chile, and 14 per cent. from the United Kingdom. This total included 30,505 tons of nitrate of soda, 3,318 tons of superphosphates, 1,660 tons of sulphate of ammonia, and 76 tons of miscellaneous manures. There is also an increasing demand for potassic manures for use on poor lands.

The British share of the chemical manures imported in 1910 is four times as much as in 1909, and constitutes one-seventh of a total that has increased by 66 per cent.

Up to the present manures have been allowed to be imported duty free, but from January, 1912, this privilege will cease, and duty will be levied as on other imports (*F.O. Reports, Annual Series*, No. 4726).

Notes on the Weather in December.

The weather underwent frequent changes in the *first* week, November 27th to December 2nd, and while its general character was unsettled, all parts of the country experienced some days with little or no rain In the south-east and north-west of England the weather was dry, "moderate" falls of rain being recorded elsewhere. Temperature differed little from the average over Great Britain generally. Bright sunshine was less than the normal in the eastern and central parts of England, and above it elsewhere.

The general condition was again extremely unsettled in the *second* week, rain falling very frequently, with, however, considerable intervals of bright sunshine. Temperature was below the normal generally, but equal to it in the Midland Counties, England E. and S.E., a Scotland N. Rainfall exceeded the average except in Scotland N., t excess being large in most districts; heavy falls occurred on Decemt 6th and 8th over a very large area in the west and north. "Abundan or "very abundant" sunshine was recorded during the week over t

Rain was almost of daily occurrence during the *third* week, and in the western and northern districts fine intervals were usually very brief. The falls over the whole week were "heavy" or "very heavy," except in Scotland N. Warmth was uniformly "moderate." Sunshine varied considerably in different districts, in Scotland N. and E. it was "scanty," in England E. and the Midland Counties it was "abundant," while in other districts it was "moderate."

Daily rain was again experienced over most of the country in the *fourth* week. In the south-east of England the aggregate rainfall was four and a half times greater than the normal. Temperature was much above the average, "unusual" or "very unusual" warmth being everywhere recorded. Bright sunshine exceeded the average only in Scotland N. and E., and was below it elsewhere.

In the *fifth* week, December 24th–30th, the weather was less disturbed generally than during the preceding week, but more or less rain was experienced on most days. The temperature was still high, warmth being "unusual" in every district except Scotland N. and E. Rainfall varied from "moderate" to "very heavy" in different districts, and sunshine was either "moderate" or "scanty" everywhere.

Crop Conditions in Great Britain on January 1st.

The Crop Reporters of the Board, in reporting on the state of the crops and the agricultural conditions on January 1st, state that the continuous rains during December generally hindered work in the fields; but as operations were well advanced at the beginning of the month, farm work is, with few exceptions, forward for the season. Wheat and beans are everywhere a good plant, healthy, and very promising. Over 80 per cent. of the whole area at present intended for wheat has already been sown, the proportion being larger in England, whereas in Wales and Scotland it does not amount to more than about three-fourths. As compared with January 1st, 1911, the area already sown would appear to be quite 7 per cent. greater in England and Wales, but in Scotland it is perhaps 4 per cent. less. The increased area would seem to be chiefly in the south-west and west midlands.

The very hot summer has left its mark upon the "seeds," which are, south of the Trent at least, weak and patchy, clovers having especially suffered, while in many districts considerable areas have been ploughed up. In the north of England the position is less unsatisfactory, and in Scotland there are some very good fields.

Special inquiries have been made as to the marketing of the potato crop, and, although the replies indicate much diversity in adjoining districts, it appears that about half the English crop has already been sold, while in Scotland the proportion is barely one-third. In many cases, however, the potatoes, although sold, have not yet been delivered.

The mild wet weather of the month has allowed some late crops of turnips and swedes, particularly the latter, and chiefly in the north, to make further growth, but generally they are scarce, small, and of p[illegible] quality, except in Scotland.

The condition of ewes is generally said to be fair considering [illegible] scarcity of food. The lack of turnips and the wet weather are, ho[illegible]

ever, very general causes of poor condition. Lambing has commenced among the Dorset Horn flocks; in Hampshire reports are so far satisfactory, but farther west there are numerous complaints of losses of lambs, or shortness of milk, or losses of ewes. Other stock have done fairly well, and the very mild month, with consequent growth of grass, has allowed of their being pastured in the fields much longer than usual, thus economising to some extent the supplies of other food.

Notes on Crop Prospects Abroad.

THE Bulletin of Agricultural Statistics for December, 1911, issued by the International Institute of Agriculture, shows the production of the cereal crops last year from information received up to December 19th. The countries in the Northern Hemisphere for which it is possible to give an approximate estimate of the area and production of wheat, rye, barley, and oats, are as follows:—Europe (excluding Portugal, Norway, Sweden, and countries south of the Danube other than Bulgaria); Canada, the United States, India, Japan, Asiatic Russia, Algeria, Egypt, Tunis. The final returns of area and production in Germany are now substituted for the preliminary figures previously published, which referred to Prussia only. Preliminary figures for Austria and Bulgaria have been added, and important revisions have also been made in the figures for Russia and the United States, which are referred to below.

Wheat.—The production of wheat in the 73 governments of Russia is now estimated to be 63,669,000 qr., a decrease of 14,222,000 qr. on the estimates given in the November Bulletin. In the United States the production of wheat is now estimated at 77,645,000 qr., a reduction of 4,271,000 qr. on the last estimate given. The figures for the area have also been revised considerably as a result of the census taken in April, 1910. The total production for all the above-mentioned countries this month is 391,515,000 qr., as compared with 397,104,000 qr. in 1910, or a decrease of 1·4 per cent.; while the total area harvested exceeds that of 1910 by 3·9 per cent.

Rye.—The production of rye in the United States is now estimated to be 3,863,000 qr., an increase of 293,000 qr. on the estimate in the previous Bulletin. The total production of rye in all the countries specified (excluding Great Britain, India, Japan, Egypt, and Tunis), is 180,702,000 qr., as compared with 190,679,000 qr. last year, a decrease of 5·2 per cent. The area harvested is greater than that of 1910 by 1·5 per cent.

Barley.—It is now estimated that Russia in Europe will produce 48,137,000 qr., as compared with the estimate last month of 51,074,000 qr., and the estimate for the United States has been increased from 17,509,000 qr. to 19,223,000 qr. on the month.

The total production in the above-named countries, with the omission of India, is estimated to be 163,551,000 qr., being about the same as that obtained in 1910. The area harvested is about 1 per cent. less than in 1910.

Oats.—The estimated total production of European Russia has been reduced by 5,310,000 qr. to 81,300,000 qr., and that of the United States increased from 80,570,000 qr. to 94,568,000 qr. on the month.

The total production in the above-named countries, with the omission of India and Egypt, is estimated at 383,579,000 qr., or 9·1 per cent less than in 1910, although the area harvested is slightly in excess of that in 1910.

Maize.—The production of maize in European Russia is now estimated at 9,556,000 qr., as against the estimate of 7,084,000 qr. given in the November Bulletin. The production in the United States is now estimated at 295,257,000 qr., against 323,810,000 qr. in the previous month. The total production in 1911 in Austria, Bulgaria, Spain, Hungary (including Croatia and Slavonia), Italy, Roumania, Russian Empire, Switzerland, Canada, United States, Japan, Algeria, Egypt, and Tunis, amounts to 370,840,000 qr., being a decrease of 10·5 per cent. on the production obtained in 1910.

The following information is given concerning crops in the Southern Hemisphere:—

Argentina.—The areas which will probably be harvested in 1911–12 are: wheat, 17,035,590 acres; oats, 2,546,570 acres. The areas harvested in 1910–11 were: wheat, 12,233,910 acres, and oats 1,605,500 acres.

Chile.—The production for the year 1911–12 is estimated at 4,821,000 qr. of wheat and 1,901,000 qr. of barley, being increases of 6·9 per cent. and nearly 670 per cent. respectively, as compared with the production of 1910–11.

Australia.—The production of wheat estimated for 1911–12 is 9,417,000 qr. or 20·8 per cent. less than in 1910–11.

New Zealand.—The prospects of wheat, barley, and maize on December 1st were average, and of oats 20 per cent. above average.

The information received by the Institute up to December 19th concerning the sowing of autumn cereals in the Northern Hemisphere was to the effect that winter sowing was almost finished, and the crops were, in general, germinating well, and development was uniform.

Argentina.—A special cable from Buenos Ayres on Thursday, December 28th last, stated that weather conditions during the week had been in the main unfavourable; the new shipping season would be late in starting. Reports from all districts of damage done by recent abnormal weather were numerous and authentic; all estimates of exportable surplus were being reduced—some substantially so. (*Corn Trade News*, December 29th, 1911.)

India.—The preliminary official estimate for the Punjab, United Provinces, Bombay and Sind, Bengal, Central Provinces, and North West Frontier, gives the area sown to wheat as 24,168,000 acres, as against 22,522,000 acres in the preliminary estimate last year, and 24,918,000 acres the final figure. The condition is described as excellent in the United Provinces, good in the Punjab, Bengal, and Central India, and fair in Bombay and the North-West Frontier. (*Beerbohm's Evening Corn Trade List*, December 29th, 1911.)

Sugar-Beet.—The official returns published in the Bulletin of the

1910. The total area harvested in the above-named countries was 4,068,000 acres, as against 3,730,000 acres last year, an increase of 9·1 per cent.

Potato Crops Abroad.—The production of potatoes in Italy, the Russian Empire, and the United States in 1911 and 1910, as reported by H.M. Ambassador at Rome, H.M. Consul-General at Odessa, and in the *Crop Reporter* respectively, is shown in the following statement:—

	1911. Thousands of Tons.	1910. Thousands of Tons.
Italy	1,665	1,514
Russia (73 Governments)	31,380	35,602
	Thousands of Bushels.	Thousands of Bushels.
United States	*273,170*	*328,511*

Census of Live Stock in the United States.—H.M. Ambassador at Washington has forwarded the results (subject to revision) of the Live Stock Census taken on April 15th, 1910. In the following table the results are compared with those of the Census taken in 1900. The figures embrace animals, whether on farms or not, in the continental United States.

	1910 (April 15).	1900 (June 1).	*Increase (+) or decrease (−).* Actual.	Per cent.
CATTLE	63,104,573	69,335,832	−6,231,259	− 9·0
Dairy Cows	21,751,183	18,108,666	+3,642,517	+20·1
Other Cattle	41,353,390	51,227,166	−9,873,776	19·3
HORSES and COLTS ...	22,813,850	21,203,901	+1,609,949	+ 7·6
SWINE	59,288,592	64,686,155	−5,397,563	− 8·3
SHEEP AND LAMBS ...	52,183,923	61,735,014	−9,551,091	−15·5

In making comparisons the different time of the year at which the two Censuses were taken must be borne in mind. It is pointed out that the decreases of certain classes of cattle, of colts, swine, and spring lambs are largely or wholly due to the changed date of enumeration. Thus only 7,965,646 spring calves were returned in 1910, as compared with 15,577,728 in 1900; a part of this difference is, however, due to the fact that in 1900 "calves" included all cattle less than one year old, but in 1910 only calves born in 1910. Again, only 12,681,170 spring lambs were returned in 1910, as compared with 21,702,447 in 1900.

Prevalence of Animal Diseases on the Continent.

The following statement shows that, according to the information in the possession of the Board on January 1st, 1912, certain diseases of animals existed in the countries specified:—

Belgium (for the period November 1st—15th).
Anthrax, Blackleg, Foot-and-Mouth Disease (816 "foyers" in 32 "communes"), Rabies.

Bulgaria (for the period December 7th—14th).
Glanders and Farcy, Rabies, Sheep-pox, Swine Fever.

Denmark (month of October).
Anthrax, Foot-and-Mouth Disease (45 cases), Glanders, Swin Erysipelas.

France (month of October).
Anthrax, Blackleg, Foot-and-Mouth Disease (14,115 "étables" i 2,748 "communes"), Glanders and Farcy, Rabies, Sheep-po Sheep-scab, Swine Erysipelas, Swine Fever.

Germany (for the period December 1st—15th).
Foot-and-Mouth Disease (15,456 infected places in 4,962 parishes Glanders and Farcy, Swine Fever.

Holland (month of November).
Anthrax, Foot-and-Mouth Disease (1,089 outbreaks in 11 provinces Swine Erysipelas.

Hungary (for the period December 6th—13th).
Anthrax, Foot-and-Mouth Disease (total of 11,711 "cours" no infected), Glanders and Farcy, Rabies, Sheep-pox, Sheep-scal Swine Erysipelas, Swine Fever.

Italy (for the period November 13th—19th).
Anthrax, Blackleg, Foot-and-Mouth Disease (270 new cases entail ing 5,695 animals), Glanders and Farcy, Rabies, Sheep-scab, Swin Fever.

Montenegro (for the period October 1st—15th).
Foot-and-Mouth Disease (96 "étables" infected in 13 "communes" Glanders.

Norway (month of November).
Anthrax, Blackleg.

Roumania (for the period November 23rd—30th).
Anthrax, Foot-and-Mouth Disease, Glanders and Farcy, Pleuro pneumonia, Rabies, Sheep-pox, Swine Erysipelas, Swine Fever.

Russia (month of June).
Anthrax, Foot-and-Mouth Disease (422,045 cases in 5,635 "communes"), Glanders and Farcy, Pleuro-pneumonia, Rabies, Sheep-pox, Swine Erysipelas, Swine Fever.

Servia (for the period December 2nd—9th).
Rabies, Swine Fever.

Spain (month of October).
Anthrax, Blackleg, Dourine, Foot-and-Mouth Disease (56,54 animals), Pleuro-pneumonia, Rabies, Sheep-pox, Sheep-scab, Swin Erysipelas, Tuberculosis.

Sweden (month of November).
Anthrax, Blackleg, Foot-and-Mouth Disease (2 "étables"), Swine Fever.

Switzerland (for the period December 11th—17th).
Anthrax, Blackleg, Foot-and-Mouth Disease (176 "étables" entailing 1,823 animals, of which 26 "étables" were declared during

Agricultural Labour in England during December.

The Board of Agriculture and Fisheries have been furnished by the Board of Trade with the following report, based on returns from correspondents in various districts, on the demand for agricultural labour in November:—

Labourers outside the regular farm staff lost a good deal of time during December on account of wet weather. The demand for such men was also affected by the forward state of farm work and by seasonal slackness, and the supply was consequently in excess of requirements in many districts. Some scarcity of men for permanent situations was reported in several parts of the Southern and South-Western Counties.

Northern Counties.—Rain caused some loss of time to extra labourers in most districts. There was a limited demand for such men for threshing, turnip pulling, manure carting, hedging, draining, &c. The supply of men was reported as more than equal to the demand in a number of Rural Districts, including those of Longtown (*Cumberland*), West Ward (*Westmorland*), and Bridlington, Great Ouseburn, Howden, Pickering, Pocklington, and Selby (*Yorkshire*).

Midland Counties.—Extra men were chiefly required for such work as threshing, carting manure, storing roots, and hedging. The demand, however, was generally only moderate, partly on account of the forward state of farm work, and in nearly all the counties in this group a surplus of extra men was reported in one or more Rural Districts, the counties in which a surplus appeared to be most general being *Staffordshire*, *Worcestershire*, and *Oxfordshire*. Loss of time on account of rain was reported in most districts, particularly in the case of threshers.

Eastern Counties.—The partial failure of the root crops was again accountable for a reduced demand for extra labourers, particularly in *Norfolk* and *Suffolk*, where a surplus of men was reported in a number of districts; some surplus was also reported in the Chesterton (*Cambridgeshire*), Bourne (*Lincolnshire*), and Braintree (*Essex*) Rural Districts. Any considerable loss of time through rain was not general, though reported in some districts, particularly in *Suffolk* and *Essex*.

Southern and South-Western Counties.—Outdoor work was considerably affected by rain in all these counties during December, and extra men were generally in irregular employment in consequence. A certain amount of work was provided for such men at threshing, carting manure, hedging, and ditching, draining, and on the root crops, but the demand, apart from the effect of wet weather, was generally only moderate, and a surplus of men was reported in several districts in *Surrey*, *Hampshire*, and *Wiltshire*, and also in the Faversham and Hollingbourne (*Kent*), Chailey (*Sussex*), and Wareham and Purbeck (*Dorset*) Rural Districts. Men for hedging and ditching were wanted in the Hereford Rural District, and there was some scarcity of men for permanent situations in the Godstone (*Surrey*), Chailey and Petworth (*Sussex*), Highworth and Swindon (*Wiltshire*), and

THE CORN MARKETS IN DECEMBER.

C. KAINS-JACKSON.

Wheat.—The average price continued for English at 2*s.* to 3*s.* above the level of a twelvemonth previous. December, 1911, wound up therefore with appreciably stronger markets than did December, 1910. Russian wheat was 3*s.* to 3*s.* 6*d.* dearer on the year, American winter 2*s.* dearer, and spring 4*s.* dearer. This interesting difference in the rise of the American sorts in England is but a faint reflection of the difference in America. New York's last market of 1911 gave prices equalling 34*s.* per 480 lb. for winter, and 41*s.* for spring wheat. It was to be noted with regard to these quotations, that while the values in England and America respectively encouraged winter wheat shipments for 1912, they appeared to prohibit supplies of the spring wheat which the English miller particularly appreciates. About 42*s.* was the best price made for the finest Manitoba and other "best Dominion" wheat, the year ending with 41*s.* to 41*s.* 6*d.* ruling. This was 5*s.* advance from the period when Canadian crop results were most favourably reported upon.

The supply of wheat on passage at the end of December was fully half a million quarters larger than at the end of 1910, the increase being in Californian and Australian, two sorts of better colour than strength. The natural anticipation, of course, is that for the first two months of 1912 strong red wheat will be a more buoyant market than weak or starchy white. The warehouses at fifteen chief ports hol just on two million quarters, a clear million less than a year agc This makes wholly for a rising market, and it is not thought likel that farmers will check the rise by heavy deliveries. They are believe to have sold about 600,000 qr. more of the new wheat in the firs four months of the cereal year than they did last season, and thi being so, the reserves of home produce are not likely to be so larg as to encourage fuller market supply than usual.

The shipments of December were 1,472,000 qr. from North Americ (including a large percentage of Canadian), 242,000 qr. from Sout America, 1,193,000 qr. from Russia, 1,183,000 qr. from Europe S.E 493,000 qr. from India, and 324,000 qr. from Australasia. The Antipo dean harvests were assumed at Christmas to be about equal in tota to those a year previously, the increased yields in Argentina balancin the decrease in Australasia.

Flour.—The mean price of Town Households at Mark Lane's 15 markets within the year 1911 was 26*s.* 4*d.* per sack, against 27*s.* 5*d* for 1910. But Minnesota First Bakers' Flour, the strong America sort largely used for mixing with English flour in making an ordinar loaf, closed as it opened, the year, at 25*s.* 6*d.* to 26*s.* per sack Finest American in 1911 never went lower than 29*s.*, and closed a 31*s.* 6*d.* London top-price on December 30th was 32*s.* for cast Hungarian fancy flour was making 39*s.*, Australian ordinary, 25*s.* 6*d* and common [illegible] roller whites [illegible] or thereabouts. The [illegible]

the supply on passage on the 30th was 138,000 sacks, against 252,000 and 258,000 at the end of the years 1910 and 1909. There was decided firmness in flour as 1911 passed away, but the small sale of bread during the mild weather told on bakers' inquiry, and made stores a little difficult to move. Fortunately for their holders they are in very moderate compass.

Barley.—Some remarkably high averages have been recorded at different markets, mostly in counties facing the North Sea, and particularly in Kent. The mean price of barley for the whole kingdom has been satisfactory, and so large a proportion of the new English has graded 432 to 448 lb. that the 400 lb. sorts of foreign have met with a specially brisk inquiry. Value for Russian advanced before Christmas to 26*s.* per qr., and just before the month closed 26*s.* 3*d.* was paid. The demand for Indian barley was good, 26*s.* to 27*s.* being offered.

Barley shipments were 15,000 qr. from California, 1,694,000 qr. from Russia, 572,000 qr. from Europe S.E., and 50,000 qr. from India. The supply on passage on the 30th was 340,000 qr., a good deal below the average. Russia and Europe S.E. combined shipped from August 1st to December 30th about the same total as in the like period of 1910, but an increased Continental demand has reduced the quantity for which English bills of lading are held.

Oats.—Rather slow trade combined with advancing prices has constituted a somewhat unusual combination. The shipments of the month were 648,000 qr. from Russia, and 170,000 qr. from Europe S.E., but the practical cessation of shipments from the New World and the failure of Australasia, South Africa, and Scandinavia as sources of supply caused the total on passage to shrink to a small figure. Russian oats at 19*s.*, La Plata at 19*s.* 6*d.*, and fine Canadian at 22*s.* 6*d.* were, as December closed, decidedly expensive articles on their feeding value. Argentina was offering to ship new crop direct to London at 16*s.* 9*d.* cost, freight, and insurance, but these supplies will not be with us in any quantity before February.

Maize.—Business was very much in holders' favour just before Christmas, and the report by the International Agricultural Institute of a 10·5 per cent. falling off in world production, which was issued on the 28th, caused many merchants to ask 31*s.* 6*d.* per qr. for their stores. America meanwhile is hurrying to get the good prices ruling, and is offering to ship new crop, cost freight and insurance, at 29*s.* per qr. direct to English ports. The price is for steamers to start within a week of order. For February delivery 27*s.* to 28*s.* is bid, and 27*s.* for March. Meanwhile a speculative trade with Buenos Ayres has sprung up, and the new La Plata crop, which will not be dry and fit to ship before the end of May, is offered for June export at 25*s.* to 25*s.* 3*d.* per qr. Maize looks like being a very speculative market for at least the first half of the year on which we have entered.

Shipments in December were 223,000 qr. from North America, 273,000 from Russia, and 1,082,000 from Europe S.E. This last is a very remarkable total. South America having shipped no maize in December, 1911, figures are already complete, and verified at 586,000 qr. There were on December 30th 345,000 qr. of maize on passage to the United Kingdom against totals of from 400,000 to 850,000 qr. at

Oilseeds.—The United States are not only buying Canadian linseed, happily a good crop, but are entering the field as buyers of the new crop in La Plata. The latter is now put at 3,500,000 qr. available for exportation, which is considerably less than was estimated a month ago. India has added some 350,000 acres to her area under linseed, which should add as many quarters at least to the export surplus available from April. The prices ruling in linseed at the end of 1911 were 71*s.* per 410 lb. for Indian on spot, 67*s.* per 416 lb. for La Plata on spot, 62*s.* for February shipment of La Plata, and 61*s.* 9*d.* for May shipment of Indian. Speculation promises to be active for some months to come. There are only 46,000 qr. on passage. *Cottonseed* in December varied for fine Egyptian between 8*s.* 3*d.* and 8*s.* 9*d.* per cwt. It closed at the lower figure, and with 740,000 cwt. on passage.

Various.—Among prices asked for fair average quality samples on December 30th, last trading day of 1911, the following may be mentioned:—English good new crop beans, 40*s.* per 532 lb.; new dun peas, 33*s.* per 504 lb.; Indian chick peas, 29*s.* per 504 lb.; Burmese dari, 28*s.* per 480 lb.; Essex rye, 32*s.* per 480 lb.; good Russian buckwheat, 28*s.* per 416 lb.; Midlothian oatmeal, 40*s.* per 280 lb.; fine Canadian oatmeal, 27*s.* 6*d.* per 240 lb.; barley meal, 16*s.* per 240 lb.; maize meal, 16*s.* 9*d.* per 240 lb.; feeding rice, 9*s.* per cwt.; beet sugar, 15*s.* per cwt.; and soy bean oil, 29*s.* per cwt. A comparison of these prices with those which ruled on December 31st, 1910, discloses an almost general increase in the cost of foodstuffs.

THE LIVE AND DEAD MEAT TRADE IN DECEMBER.

A. T. MATTHEWS.

Fat Cattle.—The general quality of the cattle coming to market, of course, improved with the exhaustion of the supply of grass-feds, and the substitution of those fed in stall and yard, though many of these showed signs of haste in their disposal. Every feeder who had anything fairly good naturally kept it for Christmas, and the great markets associated with that season began about the 9th. At many of these annual events it was remarked that really first quality beasts were unusually scarce, and it would have been surprising had it been otherwise. A keen demand for the best existed everywhere, and even cattle classed as second quality made considerably more money, and helped to raise the averages for the month. These were as follows:—Shorthorns, 8*s.* 8¾*d.*, 7*s.* 8¾*d.*, and 6*s.* 5¼*d.*, against 8*s.* 5*d.*, 7*s.* 5*d.*, and 6*s.* 3*d.* in November; Herefords, 8*s.* 9¾*d.* and 8*s.* 0½*d.*, against 8*s.* 7½*d.* and 7*s.* 8*d.*; Devons, 8*s.* 11¼*d.* and 7*s.* 10¾*d.*, against 8*s.* 7½*d.* and 7*s.* 7½*d.*; Welsh Runts, 8*s.* 6¼*d.* and 7*s.* 9*d.*, against 8*s.* 3*d.* and 7*s.* 6*d.*; and Polled Scots, 8*s.* 11*d.* and 8*s.* 2¾*d.*, against 8*s.* 7*d.* and 7*s.* 9¼*d.* per 14 lb. stone. Great credit is due to feeders of Devons for the splendid condition of a large proportion of the cattle of that breed in spite of the unfavourable season. In the week of Christmas sales and markets ending the 14th, the Devon average was the highest of all, not even excepting that of the Polled Scots. The Islington Great Market, held on the 11th, was well supplied and prices exceeded, as a rule, those of last year by about 3*d.*

Veal Calves.—There is only a small demand for veal at this season, and supplies, though greatly diminished as regards choice quality, were quite ample. The averages for the month were 8¼*d.* and 7¼*d.* per lb. for first and second quality.

Fat Sheep.—The very low price of fat and store sheep has been one of the worst features of the farming year, but it is generally recognised that, at least for the last few months, it has been caused, not by abnormal numbers in the country, or any decline in the ordinary demand, but by the exigencies of the season and the difficulties of farmers as regards "keep." The general condition of the sheep which have been offered to the butcher has been bad, and this drawback was aggravated as the season advanced. This told heavily against the price of sheep through the decrease thereby entailed on the value of the "fifth quarter." The low prices of November were indeed rather more than maintained, but this was partly owing to the growth of the fleece, natural to the season, and the firm trade in skins. Downs averaged in the English markets a fraction over 7⅝*d.* per lb., but not quite 8*d.* for first quality, against a bare 7¾*d.* in November. Second quality averaged 7*d.*, against 6¾*d.*, and third 5½*d.*, against 5¼*d.* The Longwools did quite as well relatively, their averages being 7½*d.*, 6½*d.*, and 5*d.*, against 7¼*d.*, 6¼*d.*, and 5*d.* per lb. It will thus be seen that the small fluctuations which have occurred have been in sellers' favour, pointing to a growing scarcity of sheep in marketable condition.

Fat Pigs.—Bacon pigs have declined very slowly, but surely, for many months, and at present there is no sign of the end of this depression. Averages in December were 6*s.* 1¼*d.* per 14 lb. for prime small, and 5*s.* 6½*d.* for the heavier weights.

Carcass Beef—British.—The movements in values in the Central London Market are fairly typical of those of the whole country, and prices of native beef were very firm in December. Scotch short sides averaged 7*d.* to 7¼*d.*, according to quality, and long sides 6⅝*d.* to 6¾*d.* per lb., which was a shade higher than in November. English sides have been better supplied than for some months, and averaged 6*d.* to 6½*d.* per lb. There were no fancy or extra Christmas prices, but a good steady demand and ready clearance.

Port-Killed Beef.—The supplies of Deptford-killed sides have been extremely moderate, and this article meets with plenty of competition. Prices therefore have ruled strong, and the month's average is relatively high at 6*d.* to 6⅜*d.* per lb.

Chilled Beef.—United States chilled quarters have been scarcely discoverable on the London market, and quotations were nil. Argentine hindquarters ranged up to 3*s.* 6*d.* per 8 lb., the averages being 3*s.* 3½*d.* and 2*s.* 11½*d.* for first and second quality respectively. Forequarters also sold better, and averaged 2*s.* 1½*d.* and 1*s.* 11*d.* Both these quotations are much higher than those of November.

Frozen Beef.—"Hard" beef has been dealt in steadily, though the volume of business was limited. Prices were slightly higher, and averaged 2*s.* 3¼*d.* to 2*s.* 5½*d.* per 8 lb. stone for hinds, and 1*s.* 8¾*d.* to 1*s.* 10¼*d.* for forequarters.

Carcass Mutton—Fresh-Killed.—Until the last week the trade in

large supplies of the first-named. After Christmas the very small arrivals from the north caused a sharp advance of ⅛d. per lb. Scotch averaged 7d. and 6½d. for first and second quality, English 6⅛d. and 5⅝d., and Dutch 6d. and 5⅝d. per lb.

Frozen Mutton and Lamb.—The best New Zealand mutton averaged 4⅛d. and 4d. per lb.; Australian, 3½d.; and Argentine 3⅛d. to 3⅝d. per lb. Frozen lamb was firm for the time of year, and its averages (for New Zealand) of 5½d. and 5⅛d. per lb. were slightly above those of November. Australian new season lamb fetched 4½d. to 5d. per lb.

Veal.—British veal of first and second quality averaged in London 7⅝d. and 6⅝d. per lb., but there were lower qualities on offer which did not approach these in price.

Pork.—The weather was rather too mild and damp for the trade, but, nevertheless, prices improved during the last two weeks, when 7d. per lb. was touched at Smithfield for prime small English. The month's averages were 6⅝d. and 5⅞d. for first and second quality. Dutch sold at slightly lower prices.

THE PROVISION TRADE IN DECEMBER.

HEDLEY STEVENS.

Although the year 1911 was a trying one for dealers, especially during the three months of abnormally hot weather, on the whole business has not been so trying and unprofitable as during the year 1910. Hog products have been more plentiful and cheaper than for the past two years, with freer arrivals from most countries, especially from the United States of America and Denmark. As a result of the high prices of feeding stuffs, English pigs have been marketed very freely during the latter part of the year, which will mean higher prices for the raw material, and dearer bacon during 1912, the same conditions having existed in other countries. The hot weather during the principal months for manufacturing cheese and butter caused a large shrinkage in the home make, and prices for both these commodities are expected to range exceptionally high before the next season commences.

Bacon.—The consumptive demand was disappointing for the month, considering the low prices prevailing, most descriptions being procurable at under November's low prices. The special features were the continued free offerings and comparatively low prices of long sides. In one week in the month the killings in Denmark created a record for that country, being 55,200 pigs.

Arrivals from America and Canada were in excess of requirements, and in consequence prices have favoured buyers. The demand for hams for the Christmas trade was unusually small. Dealers report that in December, 1910, when prices ranged from 17s. to 20s. per cwt. higher, their sales were considerably larger.

The consumptive demand in America for December is reported less, and in consequence packers have been able to accumulate a little stock in their cellars, and prices are slightly in buyers' favour. During

Chicago during the month ranged from $5.50 to $6.50, against $7.15 to $8.00 during the same period of 1910, and $7.80 to $8.70 two years back. English pigs were not marketed quite so freely, and in some districts higher prices were realised.

Cheese.—The demand has been moderate throughout the month with a continued tendency for higher prices on account of the small stocks available at all points, the month's advance being 1*s.* to 2*s.* on Canadians, or about 13*s.* to 16*s.* per cwt. over prices current at the same time in 1910. At the end of the month cable advices from Canada confirmed the reports as to the small stocks on hand in that country, and ask from 72*s.* 6*d.* to 74*s.* c.i.f. for prompt shipment. At the same period of 1910 purchases could be made at around 56*s.* to 57*s.* c.i.f. The shipments from May 1st to December 20th from Montreal, Quebec, Portland, and St. John's, show a decrease over 1910 of 92,435 cheese. At the end of the month the estimated stocks of Canadian cheese at the principal distributing centres (London, Liverpool, and Bristol), were 262,000 cheese, against 404,000 at the same time in 1910, and 377,000 two years ago. In the United States cheese are above an export basis, and extreme prices are anticipated during the winter.

Fair quantities of New Zealand cheese are arriving by each steamer, and selling at from 2*s.* to 3*s.* per cwt. under Canadians. Cable advices from that Colony report dry weather, which will doubtless reduce the make, but up to the end of December the shipments from the commencement of this season show a decrease.

There has been a good demand for English cheese, and really best lots realised high prices, in some cases 20*s.* to 22*s.* per cwt. over prices current at the same time in 1910.

Butter.—During the greater part of the month the demand was slow, and prices showed little change. By the end of the month the market was considerably influenced by the operations of speculators on the London market, and prices advanced, more especially for all descriptions of Colonial. Stocks are smaller at all points than usual at this time of year, and it is confidently expected that extremely high prices will be experienced during the winter. The shipments from New Zealand since the opening of the season to the end of December show a shortage of 1,940 tons compared with last year, but those from Australia show a slight increase. Spot prices at the end of the month ranged from 22*s.* to 26*s.* per cwt. over last year, and are considered by many to be dangerously high for so early in the season. Canada has sent us this season an increased quantity of over 107,000 packages over last year, but these have been mostly consumed. She is now short of butter for her home trade, and western points will have to import from New Zealand and Australia to supply their demand before the new season's Canadian can be placed on the market. The United States of America is also short of butter, the American Warehousemen's Association figures showing a shortage of nearly 26 million pounds on December 1st against the same date of 1910. This includes thirty-eight of the principal storage depots.

Eggs.—There has been a continued shortage of new laid eggs, and prices remain high. The mild weather has curtailed the consumption,

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of December, 1911.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	England. First Quality.	England. Second Quality.	Scotland. First Quality.	Scotland. Second Quality.
FAT STOCK:—	*per stone.**	*per stone.**	*per cwt.†*	*per cwt.†*
Cattle:—	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Polled Scots	8 11	8 5	41 11	38 0
Herefords	8 10	8 0	—	—
Shorthorns	8 9	7 9	40 7	37 3
Devons	9 0	8 0	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	*d.*	*d.*	*d.*
Veal Calves	8¼	7¼	8½	7¼
Sheep:—				
Downs	8	7	—	—
Longwools	7½	6½	—	—
Cheviots	8¼	7½	8	6¾
Blackfaced	7¾	6¾	7¾	6½
Cross-breds	7¾	7	8¼	7¼
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs:—	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Bacon Pigs	6 2	5 8	5 10	5 3
Porkers	7 0	6 5	6 5	5 9
LEAN STOCK:—	per head.	per head.	per head.	per head.
Milking Cows:—	*£ s.*	*£ s.*	*£ s.*	*£ s.*
Shorthorns—In Milk ...	22 8	18 7	24 0	18 19
,, —Calvers... ...	22 14	17 2	20 15	17 6
Other Breeds—In Milk ...	17 14	16 6	20 3	16 5
,, —Calvers ...	12 10	11 15	19 13	16 3
Calves for Rearing	2 0	1 11	2 12	1 16
Store Cattle:—				
Shorthorns—Yearlings ...	9 3	7 14	10 17	8 15
,, —Two-year-olds..	12 18	11 8	14 5	11 15
,, —Three-year-olds	16 15	15 1	14 10	13 0
Polled Scots—Two-year-olds	—	—	16 6	13 14
Herefords— ,,	14 5	12 19	—	—
Devons— ,,	13 11	11 5	—	—
Store Sheep:—				
Hoggs, Hoggets, Tegs, and Lambs—	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Downs or Longwools ...	30 7	24 6	—	—
Scotch Cross-breds ...	—	—	29 1	23 3
Store Pigs:—				
8 to 10 weeks old	12 10	9 2	15 5	11 7
12 to 16 weeks old	22 6	16 1	—	—

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of December, 1911.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	Quality.	Birmingham.	Liverpool.	London.	Manchester.	Edinburgh.	Glasgow.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt s. d.
BEEF:—							
English	1st	57 6	55 0	60 0	55 0	59 6*	60 0*
	2nd	51 6	50 0	56 0	50 0	52 6*	53 6*
Cow and Bull ...	1st	49 0	44 6	46 6	46 6	46 6	48 0
	2nd	41 6	39 6	42 0	42 0	38 0	41 6
U.S.A. and Canadian:—							
Port Killed ...	1st	—	55 0	59 6	—	—	—
	2nd	—	51 6	55 6	—	—	—
Argentine Frozen—							
Hind Quarters...	1st	34 6	35 0	34 6	35 0	34 6	35 6
Fore ,, ...	1st	25 6	25 6	26 0	25 6	24 6	25 6
Argentine Chilled—							
Hind Quarters...	1st	44 6	39 0	46 0	39 6	44 0	43 6
Fore ,, ...	1st	27 6	25 6	29 6	26 0	29 6	30 6
Australian Frozen—							
Hind Quarters...	1st	33 0	32 6	34 6	33 0	—	32 6
Fore ,, ...	1st	25 6	23 6	26 0	23 6	—	23 6
VEAL:—							
British	1st	60 6	72 6	71 0	72 0	—	69 0
	2nd	56 0	66 6	63 0	66 6	—	65 6
Foreign	1st	—	—	71 0	—	—	—
MUTTON:—							
Scotch	1st	—	67 0	65 6	67 0	58 6	67 6
	2nd	44 6	60 6	60 6	62 6	52 0	49 0
English	1st	59 0	60 6	57 0	62 6	—	—
	2nd	56 0	56 0	53 0	59 0	—	—
Argentine Frozen ...	1st	35 6	36 0	35 6	36 0	34 0	34 6
Australian ,, ...	1st	34 6	34 0	32 6	34 0	—	33 6
New Zealand ,, ...	1st	—	—	41 6	—	—	—
LAMB:—							
British	1st	—	—	—	—	—	—
	2nd	—	—	—	—	—	—
New Zealand ...	1st	53 0	48 6	51 6	48 6	—	—
Australian	1st	47 0	41 6	45 0	41 6	—	39 6
Argentine	1st	44 6	42 0	45 0	42 0	—	39 6
PORK:—							
British	1st	61 0	56 6	59 6	60 0	55 6	55 0
	2nd	57 6	51 6	55 0	54 0	46 6	49 6
Foreign	1st	—	—	55 6	—	—	—

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1909, 1910 and 1911.

Weeks ended (*in* 1911).	WHEAT.						BARLEY.						OATS.					
	1909.		1910.		1911.		1909.		1910.		1911.		1909.		1910.		1911.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
Jan. 7 ...	32	9	33	6	30	5	26	11	24	11	23	11	17	5	17	2	17	0
,, 14 ...	32	8	33	8	30	8	27	1	24	11	23	10	17	5	17	7	17	2
,, 21 ...	33	2	33	9	30	11	27	3	24	11	24	4	17	8	17	6	17	4
,, 28 ...	33	0	33	6	30	11	27	6	25	0	24	5	17	9	17	4	17	3
Feb. 4 ...	33	4	33	7	30	9	27	7	24	10	24	5	17	10	17	7	17	5
,, 11 ...	33	8	33	4	30	5	27	8	24	9	24	6	17	11	17	11	17	5
,, 18 ...	34	1	33	0	30	3	27	11	24	6	24	7	18	0	18	0	17	6
,, 25 ...	34	5	32	7	30	2	28	0	24	2	24	9	18	0	17	10	17	7
Mar. 4 ...	34	10	32	7	30	0	27	11	24	6	25	0	18	2	18	1	17	5
,, 11 ...	35	8	32	6	30	1	28	4	24	1	25	0	18	2	18	0	17	5
,, 18 ...	35	9	32	6	30	1	28	0	23	6	24	11	18	5	18	0	17	6
,, 25 ...	36	0	32	9	30	2	28	0	23	7	25	0	18	6	17	11	17	5
Apl. 1 ...	36	5	33	0	30	3	27	10	23	8	24	11	18	8	18	0	17	5
,, 8 ...	37	4	33	6	30	4	28	0	23	1	24	7	18	10	17	11	17	7
,, 15 ...	38	7	33	7	30	3	27	8	23	5	25	2	19	2	18	3	18	3
,, 22 ...	41	4	33	7	30	4	28	2	23	0	25	5	19	9	18	3	17	10
,, 29 ...	42	5	33	0	30	11	27	10	22	10	25	5	20	0	18	3	18	3
May 6 ...	40	9	32	6	31	4	27	7	22	7	25	7	20	3	18	2	18	6
,, 13 ...	41	6	32	1	31	8	27	3	22	0	25	1	20	6	18	1	19	0
,, 20 ...	42	8	31	10	32	6	27	0	21	8	25	4	20	11	17	8	19	2
,, 27 ...	42	6	31	3	32	8	26	3	21	4	25	0	21	0	17	10	19	5
June 3 ...	43	1	30	2	32	5	25	7	21	8	24	10	21	3	17	10	19	5
,, 10 ...	42	11	29	1	32	4	26	10	20	9	25	7	21	4	17	10	19	7
,, 17 ...	42	7	29	0	32	3	26	10	18	11	23	11	21	6	18	0	19	8
,, 24 ...	42	8	29	4	31	11	27	2	20	1	23	9	21	7	17	9	19	10
July 1 ...	42	9	29	9	31	10	27	2	19	11	24	5	21	9	17	7	19	9
,, 8 ...	43	0	30	4	32	1	26	4	19	5	25	10	21	8	17	4	19	9
,, 15 ...	43	3	31	1	32	3	26	10	21	3	25	10	21	9	17	7	19	11
,, 22 ...	44	0	31	11	32	5	27	4	19	9	24	3	22	5	17	5	19	5
,, 29 ...	43	5	33	5	32	5	24	6	20	10	23	8	22	2	18	1	19	7
Aug. 5 ...	44	9	33	9	32	0	27	4	20	5	24	4	22	11	18	3	18	2
,, 12 ...	44	9	33	5	31	6	24	9	20	4	26	9	21	8	18	0	18	0
,, 19 ...	41	6	32	11	31	6	23	11	20	11	27	8	19	8	17	11	17	10
,, 26 ...	38	5	32	7	31	8	24	7	20	10	28	10	19	4	17	2	18	0
Sept. 2 ...	37	2	32	2	31	7	26	3	22	10	28	4	19	6	17	2	18	3
,, 9 ...	34	11	31	11	31	10	26	1	23	3	28	4	18	5	17	2	18	1
,, 16 ...	33	6	30	11	32	0	26	5	24	3	29	0	17	9	16	6	18	5
,, 23 ...	32	9	30	2	32	4	26	8	24	2	29	11	17	7	16	3	18	9
,, 30 ...	32	2	30	1	32	6	26	9	24	4	30	5	17	2	16	4	19	1
Oct. 7 ...	31	8	30	1	32	7	26	9	24	7	30	9	17	0	16	3	19	5
,, 14 ...	31	4	30	2	32	9	27	0	25	1	31	0	17	0	16	2	19	10
,, 21 ...	31	8	30	4	32	9	27	7	25	3	31	5	16	11	16	1	19	11
,, 28 ...	31	10	30	4	33	1	27	9	25	4	31	7	17	0	16	2	20	6
Nov. 4 ...	32	5	30	4	33	4	27	9	25	6	31	10	17	0	16	2	20	8
,, 11 ...	32	5	29	11	33	4	27	7	25	4	32	7	17	1	15	11	20	11
,, 18 ...	32	7	29	8	33	1	27	0	25	1	32	10	17	4	16	1	21	[illegible]
,, 25 ...	33	0	29	11	33	0	26	8	24	10	33	5	17	3	16	4	20	[illegible]
Dec. 2 ...	33	3	30	6	32	10	26	1	24	7	33	10	17	4	16	7	20	1
,, 9 ...	33	3	30	9	32	9	25	7	24	3	34	0	17	3	16	9	20	[illegible]
,, 16 ...	33	2	30	7	32	11	25	3	23	9	33	5	17	4	16	10	20	[illegible]
,, 23 ...	33	1	30	7	32	9	25	2	23	10	33	5	17	4	16	9	20	[illegible]
,, [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	25	1	23	9	33	4	17	4	16	9	20	[illegible]

AVERAGE PRICES of **Wheat, Barley,** and **Oats** per Imperial Quarter in FRANCE, BELGIUM, and GERMANY, and at PARIS, BERLIN, and BRESLAU.

—		Wheat. 1910.	Wheat. 1911.	Barley. 1910.	Barley. 1911.	Oats. 1910.	Oats. 1911.
		s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
France:	November	46 2	43 3	25 8	27 11	21 0	22 2
	December	46 7	43 4	25 10	28 2	21 3	22 4
Paris:	November	48 1	43 9	26 0	27 3	21 3	22 11
	December	48 5	44 2	26 2	27 7	21 8	23 2
Belgium:	October	33 7	34 1	22 6	27 7	18 11	22 4
	November	32 3	33 10	22 6	27 11	19 7	22 9
Germany:	October	40 11	43 3	26 8	34 4	20 9	25 0
	November	40 6	42 9	27 11	35 1	20 10	25 0
Berlin:	October	43 1	43 10	—	—	20 3	25 7
	November	43 0	43 7	—	—	20 6	25 2
Breslau:	October	38 5	40 4	25 9* 22 11†	30 10* 25 1†	20 7	23 7
	November	37 9	39 9	26 6* 22 11†	32 6* 27 7†	19 9	23 6

* Brewing. † Other.

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the German quotations are taken from the *Deutscher Reichsanzeiger*, the prices for the German Empire representing the average of the prices at a number of markets.

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of December, 1910 and 1911.

—	Wheat. 1910.	Wheat. 1911.	Barley. 1910.	Barley. 1911.	Oats. 1910.	Oats. 1911.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
London	31 4	34 0	23 1	31 10	18 5	22 2
Norwich	30 8	32 7	23 6	33 7	16 11	21 3
Peterborough	30 1	32 4	23 7	32 1	16 6	20 11
Lincoln	30 4	32 10	23 6	33 5	16 6	20 7
Doncaster	30 4	32 10	23 4	33 5	16 5	20 5
Salisbury	30 1	32 1	22 1	33 1	16 3	20 4

CORN PRICES:—ANNUAL AVERAGES.

AVERAGE *PRICES* of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Weekly Averages of Corn Returns from the Returning Markets, together with the QUANTITIES returned as sold at such Markets during each of the Years 1905 to 1911.

Years.	Prices.						Quantities.		
	Wheat.		Barley.		Oats.		Wheat.	Barley.	Oats.
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	Quarters.	Quarters.	Quarters.
1905... ..	29	8	24	4	17	4	2,467,551	3,265,613	1,073,611
1906	28	3	24	2	18	4	2,684,101	3,210,995	1,011,931
1907	30	7	25	1	18	10	2,722,847	3,317,521	1,374,260
1908.. ..	32	0	25	10	17	10	3,293,566	3,293,916	1,304,223
1909... ...	*36*	*11*	*26*	*10*	*18*	*11*	*2,641,225*	*2,699,628*	*905,983*
1910	31	8	23	1	17	4	3,072,523	3,205,203	791,121
1911.. ...	31	8	27	3	18	10	3,140,257	3,123,986	858,341

AVERAGE VALUE per IMPERIAL QUARTER OF WHEAT IMPORTED into the UNITED KINGDOM from the undermentioned Foreign Countries and British Possessions in the years 1909, 1910, and 1911.

Countries from which consigned.	Average Value per Imperial Quarter.					
	1909.		1910.		1911.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*
Argentine Republic	39	9	34	11	33	4
Chile	39	1	33	7	33	0
Germany	38	3	36	11	33	6
Bulgaria	—		33	0	—	
Roumania	40	9	34	2	34	7
Russia	39	3	35	7	33	4
Turkey	32	4	30	0	27	3
U.S. of America	38	6	37	3	34	9
British East Indies	40	8	35	5	33	7
Canada	39	3	36	9	34	10
Australia	41	5	37	2	34	10
New Zealand	40	6	32	7	32	11

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certa MARKETS in ENGLAND and SCOTLAND in the Month December, 1911.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Bristol. First Quality.	Bristol. Second Quality.	Liverpool. First Quality.	Liverpool. Second Quality.	London. First Quality.	London. Second Quality.	Glasgow. First Quality.	Glasgow. Secon Qualit
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s.*
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 l
British ..	16 0	15 0	—	—	18 0	16 0	16 0	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cw
Irish Creamery	134 0	126 0	131 0	128 0	—	—	—	—
,, Factory	122 0	110 0	121 0	117 0	—	—	—	—
Danish ..	—	—	138 0	135 6	139 0	136 6	135 0	—
French ...	—	—	—	—	145 6	141 6	—	—
Russian ..	124 0	120 0	125 0	121 6	126 6	122 6	122 0	—
Canadian ...	129 6	125 6	125 0	122 0	—	—	—	—
Australian ...	131 6	128 0	130 0	127 0	128 0	125 6	129 0	126 [illegible]
New Zealand	134 6	132 0	133 0	131 0	133 6	129 6	133 0	132 [illegible]
Argentine ..	130 0	128 0	129 6	127 6	127 6	125 0	130 0	—
CHEESE :— British—								
Cheddar ...	89 0	84 0	88 0	84 0	95 0	86 0	76 0	74 [illegible]
			120 lb.	120 lb.	120 lb.	120 lb.	120 lb.	120 lb
Cheshire ...	—	—	87 0	81 0	94 6	86 0	—	—
			per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt
Canadian ...	71 0	69 6	71 0	69 0	71 6	70 0	70 0	—
BACON :—								
Irish	57 6	54 0	55 0	51 6	59 0	56 6	55 6	—
Canadian ...	51 6	49 0	50 0	47 0	52 0	48 0	51 0	49 [illegible]
HAMS :—								
Cumberland ...	—	—	—	—	111 6	103 0	—	—
Irish	—	—	—	—	118 0	107 0	78 0	74 [illegible]
American (long cut)	58 0	54 6	56 0	52 0	61 6	57 6	54 0	—
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 12
British ...	20 0	18 4	—	—	20 5	—	—	—
Irish	18 5	17 7	16 6	15 6	17 0	16 0	17 4	15 [illegible]
Danish ...	—	—	16 3	15 3	18 0	16 4	17 1	16 7
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton	per ton.	per ton.	per ton
Edward VII.	90 0	80 0	63 6	58 6	78 6	72 6	—	—
Langworthy ..	85 0	80 0	81 6	75 0	96 0	88 6	—	—
Up-to-Date ...	80 0	72 6	55 0	51 6	82 6	75 0	58 6	53 [illegible]
HAY :—								
Clover ...	110 0	100 0	120 0	95 0	122 0	100 0	86 0	81 [illegible]
Meadow ...	105 0	95 0	—	—	116 6	94 6	—	—

DISEASES OF ANIMALS ACTS, 1894 to 1911.

NUMBER OF OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	DECEMBER.		TWELVE MONTHS† ENDED DECEMBER.	
	1911.	*1910.*	*1911.*	*1910.*
Swine-Fever:—				
Outbreaks	234	238	2,466	1,598
Swine Slaughtered as diseased or exposed to infection ...	3,404	2,019	30,434	15,543
Anthrax:—				
Outbreaks*	69	178	908	1,496
Animals attacked	131	209	1,121	1,776
Foot-and-Mouth Disease:—				
Outbreaks	1	--	10	2
Animals attacked	20	-	487	15
Glanders (including Farcy):—				
Outbreaks	16	21	208	351
Animals attacked	38	58	501	1,014
Sheep-Scab:—				
Outbreaks . . .	80	157	434	556

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	DECEMBER.		TWELVE MONTHS† ENDED DECEMBER.	
	1911.	1910	1911.	1910.
Swine-Fever:—				
Outbreaks	32	10	175	105
Swine Slaughtered as diseased or exposed to infection ...	222	269	2,566	2,236
Anthrax:—				
Outbreaks	—	—	9	7
Animals attacked .	—	1	16	13
Glanders (including Farcy):—				
Outbreaks	—	—	2	1
Animals attacked	—	—	3	2
Sheep-Scab:—				
Outbreaks	38	86	342	491

* For 1910 the figures show the outbreaks reported, but for 1911 the outbreaks confirmed.

† The twelve months comprise 53 weeks in 1910 and 52 weeks in 1911.

ADDITIONS TO THE LIBRARY.

Agriculture, General and Miscellaneous—

U.S. Dept. of Agriculture, Office of the Secretary.—Circ. No. 38 :—Conservation of the Soil. (8 pp.) Washington, 1911. [B. 40–1.]

Royal Commission on Sewage Disposal.—Seventh Report. Vol. III.—Appendices.—Part II. :—Minutes of Evidence with regard to the Treatment of Trade Effluents. Reports by the Officers of the Commission upon the Preliminary Treatment of Sewage in Slate Beds. [Cd. 5543–1.] (215 pp.) London : Wyman & Sons, 1911. 1*s.* 9*d.* [B. 24–7.]

Sociedad Rural Argentina.—Argentina, its Agriculture and Live Stock in 1910. (176 pp. and map.) Buenos Aires, 1911. [A. 82 ; F. 52.]

U.S. Dept. of Agriculture, Office of Experiment Stations.—Bull. No. 240 :—Tidal Marshes and their Reclamation. (99 pp. + xvi. plates and 6 maps.) Washington, 1911. [B. 56.]

Institut International d'Agriculture.—Assemblée Générale, Troisième Session, May, 1911. Procès Verbaux. (640 pp.) Rome, 1911.

[This volume also contains reports presented to the Assembly by Delegates to the Permanent Committee, *e.g.*, a Report by Dr. Mueller on the Agricultural Statistical Service; a Report by Professor Cuboni on Plant Diseases; and a Report by M. de Miklos on the Campbell System of "Dry Farming."]

Field Crops—

Memoirs of the Dept. of Agriculture, India, Botanical Series.—Vol. IV., No. 2 :—Studies in Indian Fibre Plants. No. 2. On Some New Varieties of *Hibiscus Cannabinus*, L., and *Hibiscus Sabdariffa*, L. (36 pp. + 7 plates.) Calcutta, 1911. Rs. 3. [C. 48.]

California Agricultural Experiment Station.—Bull. No. 212 :—California White Wheats [including milling and baking tests]. (313–394 pp.) Berkeley, California, 1911. [C. 2–1.]

Ohio Agricultural Experiment Station.—Bull. No. 231 :—Wheat Experiments. (22 pp.) Wooster, Ohio, 1911. [C. 2–1.]

Deutsche Landwirtschafts-Gesellschaft.—Arbeiten. Heft 194 :—Hafer im Bilde. (17 pp. + 16 plates.) Berlin : Paul Parey, 1911. [C. 16.] 2 M.

Hawaii Agricultural Experiment Station.—Bull. No. 23 :—Leguminous Crops in Hawaii. (30 pp. + 8 plates.) Washington, 1911. [C. 44–1.]

Braham, Frank.—The Rubber-Planter's Note Book. (108 pp.) London : Crosby, Lockwood & Son, 1911. 2*s.* 6*d.* net. [C. 58–3.]

Colonial Office.—Return showing the Places throughout the Empire where Tobacco is cultivated and the Extent of the Industry, and whether in any of the Overseas Dominions there is any Excise or Export Duty on the Home-Grown Tobacco, and if so, the Amount. (H. C. 303, 1911.) (7 pp.) London : Wyman & Sons, 1911. 1*d.* [C. 54.]

Palmer, Truman G.—Letter and Data Concerning the Indirect Agricultural Benefits which are Derived from the Culture of Sugar Beets. [U.S. Senate Document No. 76.] (22 pp.) Washington, 1911. [C. 34–3.]

Colorado Agricultural Experiment Station.—Bull. No. 176 :—Productiveness and Degeneracy of the Irish Potato : Preliminary Studies mostly within the Pearl Variety. (16 pp.) Fort Collins, Colorado, 1911. [C. 26–3.]

Foreign Office.—Interim Report of the British Delegate to the International Sugar Commission, together with his instructions, October, 1911. [Cd. 5859.] In continuation of Cd. 5557, 1911. (2 pp.) London : Wyman & Sons, 1911. 1*d.* [C. 34–7.]

University College, Reading.—Bull. No. X. :—Manuring of Swedes. Trials

carried out in 1910. (14 pp.) [C. 32.] Bull. No. XI. :—The Manuring of Grass Land, 1910. (18 pp.) [C. 42–9.] Bull. No. XII. :—Report of Experiments on the Comparative Nutrient Value of Yellow Globe and Golden Tankard Mangolds. Trials carried out in 1910. (5 pp.) [C. 32.] Bull. No. XIII. :—Manurial Experiments on Grass Land, 1910. (26 pp.) [C. 42–9.] Reading, 1911.

U.S. Dept. of Agriculture, Bureau of Statistics.—Bull. No. 84 :—Russian Cereal Crops. Area and Production by Governments and Provinces. (90 pp. and map.) [C. 2–3.] Bull. No. 89 :—Marketing Grain and Live Stock in the Pacific Coast Region. (94 pp.) [C. 2–3 ; F. 46.] Washington, 1911.

Kansas Agricultural Experiment Station.—Bull. No. 177 :—Milling Tests of Wheat and Baking Tests of Flour. (28–153 pp.) Manhattan, Kansas, 1911. [C. 6.]

Nebraska Agricultural Experiment Station.—Press Bull. No. 35 :—Catch Crops for Hay and Pasture. (3 pp.) Lincoln, Nebraska, 1911. [C. 44–1.]

United Provinces of Agra and Oudh, Dept. of Land Records and Agriculture.—Bull. No. 26 :—Description of the Working Sugar Factory exhibited in the Agricultural Court, United Provinces Exhibition, by Messrs. Blair, Campbell, and McLean. (15 pp.) Allahabad, 1911. [C. 34–11 ; M. 4.]

California Agricultural Experiment Station.—Bull. No. 216 :—A Progress Report upon Soil and Climatic Factors Influencing the Composition of Wheat. (547–574 pp.) Sacramento, 1911. [C. 2–1.]

Horticulture—

Thompson, J. Enoch.—The Intensive Cultivation of Small Farms. (15 pp.) Toronto : W. Briggs, 1911. 10 cents. [D. 16–7.]

Guide to Mr. Worthington Smith's Drawings of Field and Cultivated Mushrooms and Poisonous or Worthless Fungi often Mistaken for Mushrooms. (24 pp. and plates.) London : British Museum, 1910. 1*s.* [D. 44 ; E. 60–3.]

Weathers, J.—The Bulb Book, or Bulbous and Tuberous Plants for the Open Air, Stove, and Greenhouse. (471 pp.) London : John Murray, 1911. 15*s.* net. [D. 26–5.]

Canada, Dept. of Agriculture, Dairy and Cold Storage Branch.—Bull. No. 27 :—Trial Shipments of Peaches in 1910. (35 pp.) Ottawa, 1911. [D. 34.] [Information as to temperature during transit, method of packing, prices obtained, &c.]

New Hampshire Agricultural Experiment Station.—Bull. No. 153 :—Fruit Bud Formation. Progress of Investigations in 1908, 1909, 1910. (38 pp.) Durham, N.H., 1911. [D. 30.] [This bulletin deals with apples only.]

California Agricultural Experiment Station.—Bull. No. 213 :—The Principles of Wine-making. (391–442 pp.) Berkeley, California, 1911. [D. 48.]

New York Agricultural Experiment Station.—Bull. No. 339 :—Is it Necessary to Fertilise an Apple Orchard? (151–195 pp.) Geneva, New York, 1911. [D. 30.]

Washington Agricultural Experiment Station.—Bull. No. 92 :—Cherries in Washington. (32 pp.) Pullman, Washington, 1910. [D. 34.]

New Mexico Agricultural Experiment Station.—Bull. No. 76 :—Peach Experiments, 1906–10. (42 pp.) Santa Fe, New Mexico, 1911. [D. 34.]

U.S. Dept. of Agriculture, Bureau of Chemistry.—Bull. No. 141 :—Experiments on the Processing of Persimmons to Render them Nonastringent. (31 pp. + plates.) Washington, 1911. [D. 37.]

Smith, T.—The Profitable Culture of Vegetables : For Market Gardeners, Small Holders and others. (452 pp.) London : Longmans, Green & Co., 1911. 6*s.* net. [D. 18.]

Plant Diseases—

Kansas Agricultural Experiment Station.—Bull. No. 174:—Spraying the Apple Orchard. (252–291 pp.) Manhattan, Kansas, 1911. [E. 20–3.]

Virginia Agricultural Experiment Station.—Bull. No. 192:—Tomato Blight and Rot in Virginia. (16 pp.) Blacksburg, Virginia, 1911. [E. 60–7.]

Pennsylvania Agricultural Experiment Station.—Bull. No. 110:—The Control of Insects and Diseases Affecting Horticultural Crops. (44 pp.) Centre County, Pennsylvania, 1911. [E. 20–3.]

Ormerod, E. L.—British Social Wasps: An Introduction to their Anatomy and Physiology, Architecture, and General Natural History. (270 pp. + 14 plates.) London: Longmans, Green and Co., 1868. [E. 40–53.]

Küster, Dr. Ernst.—Die Gallen der Pflanzen. Ein Lehrbuch für Botaniker und Entomologen. (437 pp.) Leipzig: S. Hirzel, 1911. 17*s.* 6*d.* [E. 40–7.]

India, Agricultural Research Institute, Pusa.—Bull. No. 23:—Insecticides. Mixtures and Recipes for Use against Insects in the Field, the Orchard, the Garden, and the House. (22 pp. + 11 plates.) Calcutta, 1911. 1*s.* 2*d.* [E. 20–5.]

New York Agricultural Experiment Station.—Technical Bull. No. 18:—A Contribution to the Life-History, Parasitism, and Biology of *Botryosphæria Ribis.* (109–190 pp.) Geneva, New York, 1911. [E. 60–11.]

Ohio Agricultural Experiment Station.—Bull. No. 228:—Two Recent Important Cabbage Diseases of Ohio. [" Wilt," " Fusarium Wilt " or " Yellows," and " Black-leg," " Foot-rot " or " Phoma Wilt."] (251–297 pp.) [E. 60–7.] Bull. No. 229:—The Fusarium Blight (Wilt) and Dry Rot of the Potato. Preliminary Studies and Field Experiments. (297–337 pp.) [E. 60–37.] Wooster, Ohio. 1911.

Trinidad and Tobago, Board of Agriculture.—Circ. No. 4:—Report of Mycologist for year ending March 31, 1911. (Part II.) (46 pp.+xiii. plates.) Port-of-Spain: Government Printing Office, 1911. [E. 10.]

Brooks, F. T.—The Life-History of the Plum-Rust (*Puccinia Pruni*, Pers.) in England. (2 pp.) [Reprinted from the "New Phytologist," Vol. X., Nos. 5 and 6, May and June, 1911.] [E. 60–11.]

Massee, G.—British Fungi, with a Chapter on Lichens. (551 pp. + 40 plates.) London: G. Routledge & Sons, n.d. 7*s.* 6*d.* net. [E. 60–1.]

Colorado Agricultural Experiment Station.—Bull. No. 177:—Hold-Over Blight in the Pear. (8 pp.) Fort Collins, Colorado, 1911. [E. 60–11.]

U.S. Dept. of Agriculture, Bureau of Entomology.—Bull. No. 96, Part IV.: —Carbon Tetrachlorid as a Substitute for Carbon Bisulphid in Fumigation against Insects. (53–57 pp.) [E. 20–11.] Bull. No. 97, Part IV.:—The California Peach Borer (*Sanninoides opalescens*). (65–89 pp.+iii. plates.) [E. 40–51.] Washington, 1911.

Stebbing, E. P.—On the Life-History of *Chermes Himalayensis*, Steb., on the Spruce (*Picea Morinda*) and Silver Fir (*Abies Webbiana*). 99–124 pp.+iv. plates). [Trans. of Linnean Soc. of London, 2nd Ser. Zoology, Vol. XI., Part 6, 1910.] [E. 40–35.]

Eriksson, Jacob.—Der Malvenrost (*Puccinia Malvacearum*, Mont.): Seine Verbreitung, Natur und Entwickelungsgeschichte. [Kungl. Svenska Vetenskapsakademiens Handlingar. Band 47, No. 2.] (125 pp. + 6 plates.) London: W. Wesley & Son, 1911. [E. 60–7.]

University College, Reading.—Bull. No. IX.:—Bordeaux Mixture. (4 pp.) Reading, 1911. [E. 20–7.]

Brooks, F. T.—The Development of *Gnomonia erythrostoma*, Pers. The Cherry-Leaf-Scorch Disease. (585–605 pp. + 2 plates.) [Annals of Botany, Vol. XXIV., No. XCV., July, 1910.] [E. 60–11.]

Live Stock—

***Edinburgh and E. of Scotland College of Agriculture.*—Report XXV.:—**

Report on Cattle-Feeding Experiments with Soya-Bean Cake. (16 pp.) Edinburgh, 1911. [F. 68–1.]

Local Government Board, Reports on Public Health and Medical Subjects.—No. 57:—Report by Dr. Reginald Farrar on inquiries in China and Siberia respecting pork and bacon exported to England. (15 pp.) London: Wyman & Sons, 1911. 4*d.* [F. 34; F. 82.]

New Mexico Agricultural Experiment Station.—Bull. No. 79:—Alfalfa and Corn for Fattening Lambs. (18 pp.) Santa Fé, New Mexico, 1911. [F. 76–1.]

Rhodesia, Dept. of Agriculture.—Leaflet No. 4:—The Construction of Pig-Sties. (10 pp.) [F. 82; M. 2.] Leaflet No. 5:—Bacon Curing on the Farm. (6 pp.) [F. 82–3.] Salisbury, Rhodesia, 1911.

Departmental Committee on the Export of Live Stock.—Report. [Cd. 5947.] (47 pp.) London: Wyman & Sons, 1911. 5*d.* [F. 2.]

Royal Commission on Horse Breeding.—Fourteenth and Final Report [Cd. 5936.] (9 pp.) London: Wyman & Sons, 1911. 1½*d.* [F. 64–1.]

Illinois Agricultural Experiment Station.—Circ. No. 153:—Additional Facts in Swine Feeding with special reference to developing swine for breeding purposes. (4 pp.) [F. 82–1.] Bull. No. 150:—Feeding Farm Work Horses. (431–461 pp.) [F. 64–3.] Urbana, Illinois, 1911.

Nebraska Agricultural Experiment Station.—Bull. No. 121:—Growing Hogs in Nebraska. Part I.—The cost of a 50 pound pig, and the cost of keeping brood sows. Part II.—The cost of growing pigs on alfalfa pasture and grain. (40 pp.) Lincoln, Nebraska, 1911. [F. 82–1.]

Wisconsin Agricultural Experiment Station.—Circ. of Information No. 28:—Distribution of Licensed Stallions in the Counties of Wisconsin during 1911. (27 pp.) Madison, Wisconsin, 1911. [F. 46.]

Dairying and Food, General—

Thomson, G. Sutherland.—Milk and Cream Testing and Grading Dairy Products for School, Farm, and Factory. (204 pp.) London: Crosby, Lockwood & Son, 1911. 4*s.* 6*d.* net. [G. 56–3.]

Illinois Agricultural Experiment Station.—Circ. No. 151:—Four Systems of Dairy Farming and the Profit on Each. (24 pp.) [G. 50–1; B. 8–3.] Circ. No. 152:—Feeding Dairy Cows. (31 pp.) [G. 50–1.] Urbana, Illinois, 1911.

Veterinary Science—

Royal Commission on Tuberculosis (Human and Bovine).—Final Report. Part II. Appendix. Vol. IV.:—Investigations into the Tuberculosis occurring naturally in Certain Animals other than Man: and Modification Experiments. [Cd. 5894.] (451 pp.) London: Wyman & Sons, 1911. 4*s.* 5*d.* [H. 54–3.]

California Agricultural Experiment Station.—Bull. No. 215:—The House Fly in its Relation to Public Health. (511–548 pp.) Sacramento, 1911. [H. 50–1.]

Engineering—

U.S. Dept. of Agriculture.—Farmers' Bull. No. 461:—The Use of Concrete on the Farm. (23 pp.) Washington, 1911. [M. 2.]

[This Bulletin, which supersedes No. 235, seeks to offer elementary suggestions for the manufacture of concrete.]

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FEBRUARY, 1912.

AGRICULTURAL EDUCATION IN ENGLAND AND WALES.

THE following memorandum of revised arrangements between the Board of Agriculture and Fisheries and the Board of Education in regard to agricultural education in England and Wales, has recently been issued. [Cd. 6039, price ½d.]

We have had under consideration the arrangements for the promotion of agricultural education made by our predecessors as Presidents of the Board of Agriculture and Fisheries and the Board of Education, and published in the memorandum [Cd. 4886] of the 22nd of September, 1909; * and have come to the conclusion that, in view of the large additional sums which have become available since 1909 for the purposes of agricultural education and research under the Development and Road Improvement Funds Act, 1909, those arrangements now require some modification. It no longer appears possible to delimit the spheres of work of our two Boards by assigning to the Board of Agriculture the responsibility for the Universities and Colleges in which advanced work is being done, and to the Board of Education the responsibility for Farm Schools and such other provision for agricultural education as is on a lower plane than that of Agricultural Colleges. It has, therefore, been decided that, in future, the responsibility for Farm Institutes, as well as for the agricultural work of Universities and Colleges, shall be transferred to the Board of Agriculture, and that this Board shall be regarded as the Government Department concerned with this branch of educational work for the purposes of the Development Fund. The application for an advance from

* *Journal*, Oct., 1909, p. 529.

the Development Fund in aid of Farm Institutes, which has been made by the Board of Education, will therefore be withdrawn by them, and the Circular 778 on "Aid from the Development Fund for the provision and maintenance of Farm Institutes" issued by them on the 14th of July last is hereby cancelled. A fresh application for an advance in aid of Farm Institutes will in due course be put forward by the Board of Agriculture.

Frequent consultation and co-operation between the two Boards and their respective officers will be still necessary under the redistribution of functions, and the existing arrangements will be simplified and strengthened.

(Signed) WALTER RUNCIMAN,
President of the Board of Agriculture and Fisheries.

(Signed) JOSEPH A. PEASE,
President of the Board of Education.

19th January, 1912.

THE FEEDING OF FARM STOCK.*

CHARLES CROWTHER, M.A., Ph.D.,
Leeds University.

THE object of this and subsequent articles is to furnish guidance in the feeding of the various classes of farm live-stock, and more particularly in the compounding of rations. It cannot be too clearly emphasised at the very outset that the first essential for complete success in feeding is a good animal — good in applying food to the purposes for which it is supplied. No system of feeding will convert poor stock into good stock.

The science of animal nutrition is not yet sufficiently developed to permit of the reduction of the construction of rations to a set of precise rules, nor indeed is it likely that such simplicity can ever be attained. It has been truly said that it is the eye of the feeder that fattens his stock. Intelligent observation of the effects of the ration upon the well-being of the animal, and a practical acquaintance with the peculiarities and general requirements of each class of stock, must long remain the prime essentials for the attainment of efficiency with economy in feeding. Moreover the feeder must be

familiar with the nature and special characteristics of the different foodstuffs from which he may choose.*

It is nevertheless possible to lay down the broad lines upon which the construction of rations should be based and to indicate the standards of feeding which accord best with present-day scientific knowledge and good practice. These articles are intended to supply guidance of this character rather than to formulate any code of rules to be rigidly adhered to in all cases. It is quite possible that rations which do not comply closely with the standards laid down in the following pages may prove successful in practice, but in such cases the success is frequently accompanied by unnecessary strain upon either the pocket of the feeder or the physiological activities of the animal.

For convenience of treatment the subject-matter is divided into four parts, as follows:—

PART I.—The General Principles of Nutrition.

PART II.—The General Feeding Characteristics of different Classes of Stock.

PART III.—The Compounding of Rations.

PART IV.—Typical Rations and Suggestions for the Feeding of different Classes of Stock.

Part I. is dealt with in the present article. The remaining parts will appear in subsequent numbers of this *Journal*.

PART I.—THE GENERAL PRINCIPLES OF NUTRITION.

Foodstuffs are composed of a variety of ingredients commonly grouped under the headings Albuminoids (or Proteins), Amides, Oils (or Fats), Ash, Crude Fibre, and Soluble Carbohydrates. For information as to the nature and characteristics of these substances as food the reader is referred to Leaflet No. 74, pp. 2–5.

Before food can be of any use to the animal, it must undergo the change commonly referred to as *digestion*. This is a complex series of processes, partly mechanical and partly chemical. The object of the mechanical changes (mastication, &c.) is to reduce the food to a fine pulp, in which state it is most readily acted upon by the chemical digestive forces. These are brought to bear upon it through the agency of

* Information upon these points is given in Leaflet No. 74, on "The Purchase of Feeding Stuffs."

various ferments (or enzymes) contained in the digestive juices (saliva, gastric juice, pancreatic juice, bile, &c.) with which the alimentary tract of the animal is, under normal conditions, liberally provided. In the latest stages of the passage of the food through the animal further digestive action is effected by living bacteria, whose action, however, is more wasteful than that of the enzymes.

The general effect of these various processes is to change as large a proportion as possible of the different nutrients into soluble forms, which then pass directly or indirectly into the blood stream, and are made to serve the various requirements of the animal.

The matters removed from the food in this way are said to be *digested*, whilst the residue which resists the digestive forces—the undigested matter—is eventually ejected from the body in the solid excrement or dung.

It is obvious, therefore, that *only the digestible portion of foodstuffs can have any direct feeding value*, and hence the value to the animal of a foodstuff is determined primarily not so much by its total content of albuminoids, oil, &c., as by the proportion of these present in digestible form (see Leaflet No. 74, p. 5). Although the indigestible matter cannot supply nutriment to the animal, it may influence the efficiency of digestion in other ways, *i.e.*, by exerting a beneficial stimulus upon the walls of the digestive organs or by swelling the bulk of the food up to a proportion that is best suited to the capacity of the stomach and bowels.

Similarly also certain pleasant-smelling or sharp-tasting substances that are present in small quantities in many foodstuffs (*e.g.*, hay, roots, malt coombs, treacle), although they have no direct nutritive value, add so greatly to the aroma and palatability of these foods that they are commonly accredited with an appreciable beneficial influence upon the utilisation of the food by the animal—especially in the case of milk-production.

These indirect effects of indigestible matter and of "stimulants" are, however, so vague and incapable of measurement that it is [illegible] to regard them as insignificant in comparison with the direct value of the digested nutrients.

The table on page 901 gives an indication of the proportions

COMPOSITION AND NUTRITIVE VALUE OF VARIOUS FOODS.

	Total Dry Matter.	Digestible. Albuminoids. Crude.	True.	Oil.	Carbo-hydrates + Fibre.	Starch Equivalent per 100 lb.†	Albuminoid Ratio.
						lb.	
Cottonseed cake, Decorticated	92	35·5	34	8·5	20	71	1 : 1·2
Cottonseed cake, Undecort. Egyptian	88	16·5	15·5	5·3	20	40	2·1
Cottonseed cake, „ Bombay	87	15	14	4	21	37	2·2
Linseed cake	88	26·5	25	9·5	32	76	2·2
Cocoanut cake	89	17·5	17	9·5	39	78	3·7
Soy bean cake	88	37	34	6·5	22	67	1·1
Soy bean meal, extracted	88	40	36	1·5	24	61	0·9
Soy beans	89	31·5	27·5	15·5	2	82	2·1
Linseed	91	18	17	34	21	110	6·1
Locust bean meal	86	4·3	3·5	1	70	73	21
Maize germ meal	90	12·5	8·5	10·5	55	85	9·4
Gluten meal	90	35	33	3·5	42	77	1·6
Gluten feed	90	23	21	2·5	52	74	2·8
Rice meal	90	7	6	10	42	70	10·6
Malt culms or coombs	90	18·5	11·5	1·5	39	40	4·1
Malt	92	8	6	2	63	70	11·5
Oatmeal	90	11·5	10	7	48	72	6·4
Wheat middlings	88	13	12	5	56	74	5·3
„ sharps	88	12·5	11	3·5	50	58	5·4
„ bran, coarse	87	12	10	3	45	47	5·2
Brewers' grains (wet) fresh	24	4·2	4	1·3	10	15	3·8
„ „ (dried)	91	14·7	14	5	35	50	3·3
Treacle or Molasses	78	5·5	—	—	55	48	—
Meat meal	89	70	67	12·5	—	94	0·5
Wheat	87	10	9	1·3	65	73	7·6
Barley	86	7·2	6·7	1·9	64	74	10·2
Oats	87	10	8	5·5	45	63	6·3
Rye	87	10	9	1	65	72	7·6
Maize	89	7·5	7	4·5	65	84	11·1
Beans	86	22	19	1·2	48	67	2·8
Peas	86	19·5	17	1	53	70	3·3
Straw, wheat	86	0·4	0·2	0·4	34	12	175
„ rye	86	0·6	0·4	0·4	35	11	90
„ barley	86	1	0·7	0·5	40	19	59
„ oat	86	1·3	1	0·5	39	19	40
„ bean	82	4	3·2	0·5	36	19	11·8
„ pea	86	4·3	3·4	0·7	32	15	10
Meadow hay, medium quality	86	5·5	4	1	41	31	11
Clover hay, „ „	84	8·5	5·5	1·5	38	31	7·9
Pasture grass, young	20	3	2	0·5	10	12	5·9
„ „ old	25	2	1·5	0·5	13	11	9·6
Clover (green)	19	2·5	2	0·5	9	10	5·2
Vetches „	10	3·5	2	0·3	7	8	4·4
Lucerne „	24	3	2	0·5	9	10	5·4
Cabbage	15	2	1·5	0·5	7	9	5·6
Rape	14	2	1·5	0·5	6	8	5
Turnip tops	12	1·5	0·5	0·2	5	6	12·4
Turnips	9·5	0·6	0·2	0·1	6	6	32·5
Swedes	11·5	1·2	0·3	0·1	8	7	30
Mangolds	12	0·8	0·1	0·1	9	7	98
Carrots	13	0·8	0·4	0·1	10	9	26
Sugar beet	25	0·9	0·3	0·1	20	13	70
Jerusalem artichokes	20	1·6	0·4	0·1	16	16	41
Potatoes	25	1·1	0·1	0·1	19	19	200
Milk—Cow's whole	12·5	3·3	3·1	3·7	4·7	16	4·1
„ „ skimmed	9·5	3·3	3·1	0·7	4·5	9	6·5
„ „ separated	9	3·5	3·5	0·1	5	8	1·5
„ „ buttermilk	9·5	3·7	3·7	0·7	4·2	9	1·6
„ Ewe's	18	6	6	6·5	4·8	26	3·4
„ Mare's	9·5	2	2	1·3	5·7	11	4·4
„ Sow's	18	6	6	6	5	25	3·2
Whey (from cow's milk)	7	1	1	0·3	5	6	5·7

* The "crude albuminoids" include true albuminoids together with certain other nitrogenous substances ("amides") that are of less value to the animal.

† The figures in this column represent the weights of starch that are equivalent, for fattening or other productive purposes, to 100 lb. of the foodstuff of the composition given. They have been calculated by a method devised by Kellner (see *Journal*, Dec. 1911, p. 721).

of the different nutrients present in digestible form in average samples of the commoner feeding-stuffs, together with other information, the use of which will be explained subsequently.

The varied functions that the digested nutrients are required to sustain in the animal may be summarised briefly as follows:—

(a) *Supply of Heat.*

The temperature of the body must not fluctuate to more than a very slight extent if normal health is to be maintained. The losses of heat from the body—for the body is almost continually warmer than the surrounding atmosphere, and hence radiates heat—must therefore be made good by the production of heat in the body from the food.

(b) *Supply of Mechanical Energy.*

Even in the case of an animal completely at rest, a certain amount of mechanical energy is needed for the performance of the indispensable internal work of the body (*e.g.*, for maintaining the movements of the heart, lungs, &c.), and for the labour involved in the mastication and transmission of the food through the digestive system. The performance of this work demands a supply of energy just as surely as the movements of a steam-engine are dependent upon a steady supply of mechanical energy in the form of expanding steam.

(c) *Supply of materials to make good the normal wear and tear of the vital processes.*

In other words, the live-weight of the animal must be maintained. All vital activity involves the destruction of various ingredients of the body, and it is obvious, therefore, that unless the materials so lost be replaced the animal must lose flesh rapidly and will sooner or later die of exhaustion. This replacement can only be effected by materials digested from the food-supply.

All the foregoing requirements are fundamental, and hold good for all classes of animals. In many cases, however, there are still further requirements that the food must meet, viz.:

(d) *Supply of material necessary for the support of any productive activity of the animal.*

In all cases where the animal is either producing new substance (*e.g.*, growth, in the case of young animals;

cular energy upon the performance of work other than that included under (*b*) (External Work), this extra task can only be provided for by the supply of correspondingly increased amounts of digestible nutrients.

The requirements summarised in (*a*), (*b*), and (*c*) may be referred to as the "maintenance requirements." A ration which satisfies these requirements without leaving any margin for the productive purposes summarised under (*d*) may therefore be described as a "maintenance ration." It represents the minimum supply of food upon which the animal, when completely at rest, can sustain a normal existence without losing weight. Among animals of the same class it will be roughly proportional to the live-weight of the animal.

Any food supplied in excess of the maintenance requirements can be utilised by the animal with varying efficiency for the productive purposes outlined under (*d*), and may therefore be described as the "production ration," or the productive part of the total ration.

It is obviously impossible in the case of young growing animals to draw any such sharp distinction between maintenance and production, since there can be no "marking time" in the growth of the animal, such as simple maintenance would involve. In the case of full-grown animals, however, it is profitable to keep this distinction in mind in constructing rations; thus the maintenance requirements of a cow remain practically the same whether she yield two gallons or four gallons of milk daily. It is the production requirements that are halved when the milk-flow is halved, not the total requirements. Similar considerations apply also in the case of working animals.

The various ingredients (albuminoids, oils, &c.) of foods are not of equal value to the animal for the discharge of the requirements summarised above. There are, indeed, certain purposes (included in (*c*) and (*d*))—viz., purposes which involve the production of albuminoids in the body, such as the production of muscular tissue (lean meat), hair, skin, &c., or of the albuminoids present in the various body fluids and secretions—that can only be supported by albuminoids * in

* There is reason to believe that albuminoids may be partly replaced by "amides," but it is doubtful whether rations entirely free from albuminoids could be entirely

the food. For these purposes oils and carbohydrates are absolutely valueless. Every ration, for any class of stock, must therefore contain a certain amount of digestible albuminoids, the minimum amount requisite varying according to the class of stock and the character and amount of the "*amides*" *and digestible carbohydrates by which the albuminoids* are accompanied.

For all other purposes digestible albuminoids, oils, and carbohydrates are, to a great extent, mutually replaceable in proportions that vary somewhat according to the use to which the nutrient is put in the animal. Thus, for the production of *heat* in the animal (and in general for maintenance purposes) one pound of digested oil goes as far as 2⅜ lbs. of digested carbohydrates (starch or sugar), or nearly 2 lbs. of digested albuminoids. For the production of *animal fat*, or for the performance of *mechanical labour* (or for productive purposes in general) the relative values of digestible oil and carbohydrates remain much the same as for heat-production, but the albuminoids are for these purposes slightly inferior, or at most equal to carbohydrates. These relative values may be summarised as follows:—

RELATIVE VALUES (Starch = 1).

	Dig. Carbohydrate.	*Dig. Albuminoid.*	*Dig. Oil.*
For maintenance	1	1·25	2·4
„ production	1	0·95	2·4

As regards the digestible *fibre* of foods, for the production of heat in the body this is practically equal to the more easily dissolved carbohydrates; for the production of fat or mechanical energy, however, its value is largely dependent upon its mechanical condition. If the fibre be very hard, tough, and difficult to masticate, such nutriment as the animal extracts from it will be mainly required to supply the energy necessary to support the prolonged mastication, so that in this condition it will be practically valueless even to the classes of stock (ruminants, *i.e.*, cattle and sheep) best adapted for dealing with it. The more thoroughly it is reduced to a soft, easily masticated condition, however, before being supplied to the animal, the more nearly will it become equal to carbohydrates for productive purposes also.

From the foregoing it will be observed that albuminoids are

carbohydrates and fibre can only serve for the production of heat, mechanical energy, and fat or other non-nitrogenous materials (*e.g.*, milk-sugar). It is theoretically possible, therefore, to satisfy the requirements of animals with a purely albuminoid diet, but in farm practice this is neither attainable nor desirable, since albuminoids are both expensive to supply, and if fed too liberally are liable to cause serious derangement of health. Moreover, it has just been pointed out that for the production of heat, energy, and fat, albuminoids are far inferior to oils, and little if at all superior to carbohydrates, whereas their digestion and utilisation place a greater strain upon the system. It is thus desirable for many reasons that the supply of albuminoids in the food shall be kept down as far as possible to little more than the minimum amount necessary to support those functions that other nutrients cannot support. Exceptions to this rule arise in the feeding of young stock and working animals, and will be dealt with later.

The fate of the albuminoids within the body is largely influenced by the amount of carbohydrates, oil, and other non-albuminoid matters by which they are accompanied in the ration. It is customary to group together all these digestible non-albuminoid matters in one quantity, the oil being multiplied by 2·4 (or, say, 2½) in order to make due allowance for its high nutritive value. The ratio of the digestible albuminoids to the sum of the digestible non-albuminoids arrived at in this way is then referred to as the "albuminoid ratio." For example, a sample of oats containing 8 per cent. of digestible albuminoids, 4 per cent. of digestible oil, and 47·4 per cent. of digestible carbohydrates (and fibre) will have an albuminoid ratio of 1 to 7·1, arrived at thus:—

$$\frac{(4{\cdot}0 \times 2{\cdot}4) + 47{\cdot}4}{8} = \frac{9{\cdot}6 + 47{\cdot}4}{8} = \frac{57{\cdot}0}{8} = \frac{7{\cdot}1}{1}.$$

In the case of a few foods (treacle, potatoes, "roots," malt coombs), the "amides" are relatively abundant and need to be taken into account in calculating the ratio. The common practice is to regard them simply as heat-formers, with a value for this purpose about three-quarters of that of the carbohydrates. For example, the albuminoid ratio of swedes containing 0·3 per cent. of digestible albuminoids, 0·5 per cent. of "amides," 0·1 per cent. of digestible oil, and 8 per cent. of digestible carbohydrates (and fibre) will be 1 to 20, thus:—

$$\frac{(0{\cdot}5 \times [illegible]) + (0{\cdot}1 \times 2{\cdot}4) + 8{\cdot}0}{0{\cdot}3} = \frac{0{\cdot}38 + 0{\cdot}24 + 8{\cdot}0}{0{\cdot}3} = \frac{8{\cdot}62}{0{\cdot}3} = \frac{29}{1}.$$

It is customary to speak of a "wide" ratio or a "narrow" one, according as the proportion of carbohydrates, &c., to albuminoids is high or low. Thus a ratio 1 : 4 would be described as narrower than 1 : 8.

It was at one time thought that the maintenance in the ration of a definite albuminoid ratio, characteristic for each class of stock, was a matter of considerable importance in feeding. Practical experience, however, has long demonstrated *that the ratio may be varied widely without materially affecting the success of the feeding, provided only that the* ration supplies a *sufficiency* of albuminoids and is suited in other ways to the animal. The ratio may still be used, however, as a convenient means of representing the relative richness in albuminoids of different foodstuffs or rations.

If the albuminoid ratio be much wider than 1 : 8 (or, in the case of pigs, 1 : 10), a portion of the digestible carbohydrates will pass away undigested, and waste will ensue. In any case *it must be borne in mind that the wider the ratio, the greater* will be the weight of food that the animals must consume in order to secure the necessary minimum amount of digestible albuminoids.

VARIETIES OF WILLOWS.*

W. PALGRAVE ELLMORE and THOMAS OKEY.

MUCH has from time to time been written on the botanical side of this subject, but such information is of small practical use to growers or workers.

The description given below of the choicest known varieties of willows for basket-making purposes,† is, therefore, written exclusively for the guidance of the practical grower, and not from the botanical point of view.

Salix triandra.—*Salix triandra* is a species embracing numerous varieties, known to the basket-maker as fine tops, in contradistinction to the many varieties of the common

* Previous articles on the cultivation of Willows have appeared in this *Journal* as follows: April, 1911, p. 12; June, 1911, p. 207, and Oct., 1911, p. 557.

† Mr. [illegible] states that all the varieties described are now growing at Loughborough, near Leicester, where the nursery and adjoining willow ground of 20 acres can be visited (by appointment) by botanists, willow cultivators, or basket manufacturers.

sier (*Salix viminalis*), known as full tops. The former pecies supplies the varieties most suitable for peeling white r buff as one-year-olds. Many varieties of *triandra* are ss suitable for two-year-olds, owing to closeness of the grain f the wood and the limited growth made in one season by ıe choicest sorts. Some of the largest-growing varieties f this group are more open in the grain, and consequently etter suited for providing the larger rods required by basket-ıakers. After standing on the head three years this species ıeds its bark, a feature not common to other kinds of *Salix*, nd perhaps affording the readiest method of identification. ll varieties of this species thrive on a cool, strong loam, and ake the best growth in a wet season. In a dry period they e very liable to honey fall, green fly, and blight.

The following are varieties of *Salix triandra*:—

1. "Black Maul," a variety believed to have been brought rominently to the notice of the trade by a practical worker ımed Maul in Leicestershire, is one of the best willows for l kinds of baskets subjected to long and hard service. It extensively and chiefly grown in Leicestershire and Not-nghamshire; shoots, 4 ft. to 6 ft. 6 in. long; requires a ch, loamy soil, with strong, cool sub-soil; is a heavy opper, and always realises good prices—£4 to £5 per ton green, and £22 to £24 per ton as white or buff. Plant in. by 18 in. For the first two years this willow has a ten-ncy to grow curly-butted (with a bend at the butt-end), but the heads get established and the produce heavier, this ıjectionable feature disappears, owing to the more confined r space. Consequently close planting is necessary in order secure a straighter growth.

2. "Black Italian," a superior and harder willow, thrives st on a damp, alluvial loam, and its fertility is increased by nporary floods. A "shy" cropper, it is not extensively own, except on land especially suited to it, when it will oduce six or more tons of one-year-old green to the acre. ıis realises high prices, and is much sought after by makers the finest baskets or chairs in buff or white. As buff, its lour is a rich, dark gold, and it whitens equally well. 25 per ton is not an unusual price for white or buff. Plant in. by 18 in.; shoots, 3 ft. 6 in. to 6 ft.

3. "Black German" ranks amongst high-class willows, and is easily recognised by a wavy appearance in the growth of the shoot. Less hard than some of the varieties, it is suited to a medium loam with good drainage; it will resist blight and thrive through a dry period better than many other varieties of *S. triandra*. Shoots, 4 ft. to 7 ft. long, a heavy cropper, and straight at the butt. This willow often cuts six to seven tons to the acre, worth as green £4 per ton, or as white £20 to £22 per ton. It does not strip well for white from the water, and peels best when cut from the head about May 1st and laid in the pie for sweating.* Produces a good buff. Plant 18 in. by 18 in.

4. "French," like many of the varieties of this species, produces both light and dark coloured rods. A superior working willow; shoots, from 4 ft. to 6 ft. long. Equally suitable for white or buff. Thrives on upland soil, and does not require so much moisture as many other varieties of the *triandra*. A liberal producer, and ready seller at good prices. As green it realises £4 to £4 10*s*. per ton; white or buff, £22 to £24 per ton. Plant 18 in. by 18 in. (This must not be confused with the "French Osier" *S. viminalis*.)

5. "Pomeranian," a variety imported and highly prized by the late Mr. William Scaling. A high-class willow closely resembling "French," less vigorous in growth, but harder in quality; an ideal willow for straightness; long and slender; shoots average from 3 ft. to 5 ft.; admirably adapted for the finest willow work. Equally suited for white or buff, and a ready seller at high prices. As white, the writers have known it realise £28 per ton. Plant 18 in. by 18 in.

6. "Mottled Spaniards." The best of the Spaniards, and quite different from a rod called by the same name and grown in East Anglia. Is easily distinguishable by small red blotches, producing a mottled appearance on the upper part of the rod, when the growth is completed and the wood ripe. A heavy cropper; shoots, 5 ft. to 7 ft. 6 in. long; fairly sound quality; makes useful two-year-olds; suited to all general work; prefers a damp, cool warp or loamy soil, well drained; and makes equally good white or buff. Plant 20 in. by 20 in.

7. "Lincolnshire Dutch," a vigorous grower closely re-

sembling "French," described above, and chiefly grown in the watershed of the Trent and the Gainsborough district; much prized by growers of that locality as a good cropper. Thrives well on a heavy warp land, subject to freshets of water. Not esteemed by the basket-maker as a first-quality willow. Shoots, 4 ft. to 6 ft. 6 in. long; plant 18 in. by 18 in.

8. "Stone Rod," the hardest-wooded of this species, makes the choicest white. Its natural defect is that it grows so bent at the butt—a feature associated with all the very best-quality rods, and counteracted by a system of close planting, which compels the shoot to grow upwards for light and air. This willow thrives in the valley of the Severn and some parts of Gloucestershire. It has been tried on several kinds of soil in Leicestershire, but with comparatively little success; it is a "shy" cropper, but very valuable. Shoots, from 2 ft. to 5 ft. long. Suited to a damp, alluvial, warpy, clay soil. Plant 16 in. by 16 in. Mr. A. Slater, Chief Forester to Earl Beauchamp, sent to one of the writers in the spring of last year some very fine rods measuring over 6 ft. in length, and states that this variety pays better than anything else, and meets with a ready market.

9. "Brittany Green," a beautifully slender rod of great length for its substance, was brought from France and planted at Loughborough, Leicestershire, in the spring of 1911, on a rather dry, rich loam, or marl soil, 18 in. by 18 in. In spite of the severe drought of 1911, it wholly escaped the blight, from which so many of the *triandra* group suffered, and at the end of July had made a satisfactory and healthy growth. It is too early to speak of its working quality, but in France it is classed as first quality. Shoots, 3 ft. 6 in. to 6 ft. 6 in.

10. "Rayns's Ten-feet," a vigorous and heavy cropper of the Spaniard class. Attains a length of from 6 ft. to 10 ft., and is principally employed for white hamper work. Suited to a damp, cold loam. Plant 20 in. by 20 in.

11. "Black Holland," one of the largest and longest of this species, is believed to have been brought by the Dutch and planted first in the East Anglia low country, where it thrives better than on the watersheds of Leicestershire and Notting-

hamshire. On a favourable soil it is a vigorous and heavy cropper. The shoots are 6 ft. to 8 ft. long, and it makes an excellent two-year-old white. Grows best on strong warp land. Plant 22 in. by 22 in. for one and two years' growth, or, if for covert purposes, 24 in. by 24 in. As brown or white for large and strong gardeners' baskets it is much sought after. If the shoots are left on the head for three-year-olds they make excellent sticks, for which there is an ever-growing demand, either as brown, white, or buff.

12. "Glib Skins," a name given by growers in the Fen country to a variety closely allied to the Brown Norfolk, is largely grown in Hunts. and the Isle of Ely. It is regarded as an excellent willow for all kinds of market gardeners' baskets. A heavy cropper, and suited to very damp, warp land. Shoots, 5 ft. to 7 ft. 6 in. long. It is often attacked by fly, which greatly reduces its market value. When the crop is sound it makes a good second-quality white, and yields a satisfactory return. Plant 22 in. by 22 in. If the shoots are left on the head for three years' growth they make excellent sticks.

13. "New kind" (light and dark), often called "Norfolks," is one of the best of the larger-growing varieties of *S. triandra* and a very heavy cropper. It is suitable for either white or brown, and as brown is mainly used for all work that requires a superior rod, *i.e.*, fitching, handling, and tying. It always commands a good price and a ready market in London or any district where brown goods are made. Well suited for growers who have no convenience for whitening. Shoots, 5 ft. to 8 ft. long. Suited to a damp, heavy loam or warp land. Plant 22 in. by 22 in.

14. "Long Bud," a variety introduced to Loughborough in the spring of 1911 from Berkshire, where it enjoys a high reputation for quality. By its appearance at the end of July it seems to be identical with the dark new kind described in the preceding paragraph. Is a very heavy cropper, and usually finds its market in London, where it is classed among the first of the large varieties of the *triandra* group. Planted, at Loughborough, 20 in. by 20 in.

Salix amygdalina.—This is extremely difficult to differen-

ties is considered to be a variety of *S. triandra.* So far as the working quality is concerned, the following three varieties are equally good, and belong to the fine-top class: "Brunette Noire, or Black"; "Grisette Droite, or Straight"; "Grisette Courbe, or Bent."

These are of French origin, and were first brought to this country in the spring of 1910. They are of excellent quality. The lengths attained are: Courbe, about 5 ft.; Droite, 6 ft.; and Noire, 7 ft. The Courbe variety requires a damp, rich alluvial loam or clay, whilst the Noire and Droite appear to do well on a cool loam. Planted, at Loughborough, 18 in. by 18 in.

Salix viminalis, or Common Osier.—This important species embraces many varieties, which differ very widely in their working qualities; in fact, many are not worth cultivation. *Viminalis* is a far more vigorous and hardy species than *triandra,* and is commonly known amongst basket-makers as a full-top rod, carrying as it does a more uniform size to the top than either *triandra* or *purpurea.* It is distinguished by the strength and length of the shoots, which, in some instances, reach 12 ft., and even longer, in one season. All varieties of this species are very accommodating in their habits, and generally do best in a dry season, providing the soil is fairly strong and cool; in fact, they will grow in almost any soil, from drift to clay, and make a vigorous growth in a wet period, although the quality of the wood is then deficient, owing to the rapidity of the growth.

After a connection exceeding forty years with this class of osier we recommend the following as fittest to meet all the requirements of the general basket trade:—

"Long Skin" (perhaps "Long Skein" would be the more correct term), when it is true to kind, is the closest-grained and the hardest-wooded of all the osiers, and makes the toughest skeins; but it gives rise to more contention with buyers than any other willow grown, since many growers who possess a good-quality osier persist in describing it as "Long Skin," in the hope of realising the fancy prices sometimes paid for the true sort. Although a vigorous grower, it seldom yields a smooth crop, being frequently damaged by the larvæ of insects, which cause the top of the rod to throw

out side-shoots. This defect, commonly known amongst basket-makers as rose-top, greatly reduces its value, and the variety is not grown extensively, owing to the uncertainty of the crop. Shoots, 4 ft. to 6 ft. 6 in. Good for white one- or two-year-olds, but scarcely equal to second-quality *triandra* for buff, unless grown on a strong clay soil. Plant 20 in. by 20 in.

"Brown Merrin" is a more lengthy rod than Long Skin, with the additional advantage that the fly does not attack it nearly so much; moreover, it generally grows smooth. When grown on strong clay it makes a good second-quality white one-year-old, or first-quality two-year-olds, or excellent brown. Shoots, 4 ft. to 7 ft., and a heavy cropper. Plant 20 in. by 20 in.

"The French Osier," first imported from France by Mr. Ellmore, is the best of the *viminalis* group grown in that country. In the North of France it is greatly prized as a skein rod. Shoots, 4 ft. to 8 ft. Plant 20 in. by 20 in. It should be understood that the term "Osier" is applied exclusively to the varieties of *S. viminalis;* thus, "French," described on p. 908, and "French Osier" are quite distinct.

"Yellow Osier," a fair cropper and invariably smooth, has been observed year after year to escape all attack by fly. The larger sizes make good second-class white, and the full crop excellent brown, when grown on strong upland or meadow clay soil. Shoots, 4 ft. to 7 ft. Plant 20 in. by 20 in.

"Reed Osier," so called from its great length and straight growth, is, with the "Continental Osier," the most vigorous known; it is most suitable for holding up river banks, for wild-bird coverts, or low, out-of-the-way places. Often reaches a length of 12 ft. in one season. After the heads are well established little attention is necessary, the foliage being dense enough to destroy the vegetable growth underneath. These two varieties provide the straightest and longest sticks grown, and when left for two or three years' growth command a brisk demand amongst all makers of basket furniture—a business which has developed into a great industry in this country, and which at present seeks its main supply of sticks from Germany. When cut as one-year-olds they make good brown, and supply a larger proportion of

staking than any other variety. Plant for one-year-olds, 22 in. by 22 in.; if for sticks, 26 in. by 26 in.

Salix purpurea.—*Salix purpurea*, or the bitter willow, embraces many varieties, the chief of which are the most slender for their length of all willows; it also includes the two extremes in size. The smallest, known as Dicks or Red Buds, are the toughest willows known, whilst others grow to 9 ft.; they are easily recognisable, since all are yellow on the inside of the bark, are very bitter to the taste, and show red eyes at the spring growth.

"Light Dick, or Dicky Meadows," supposed to have been first noticed by a man of that name in Lancashire, is a variety which runs along the ground like strawberry runners; it is a very beautiful rod, wiry, and a heavy cropper, but very difficult to keep clean, since the weeders must work unshod and with their feet clothed in some soft fabric in order to avoid bruising the shoots. Unsuitable for white, but makes very choice buff, and is now largely used in the making of tea and luncheon baskets; for all classes of fine buff goods it has no equal. Shoots, 18 in. to 5 ft. Will do equally well on drift or heavy soil, and is not affected by dry or wet seasons—a peculiar feature of all varieties of *purpurea*. Plant 16 in. by 16 in.

"Old Dicks, or Red Buds." Another variety in all respects like the above, except that it does not make so large a growth. Shoots, 12 in. to 3 ft. 6 in., and grows half upright. Plant 16 in. by 16 in.

"Dark Dicks," another of the same variety, grows longer than either of the above and upright; it is used for staking and also for skeins. Shoots, 2 ft. to 6 ft. Plant 16 in. by 16 in. This and the preceding variety are in good demand as brown by the makers of ladies' hand-baskets.

"Kecks'," a long, slender, and very tough rod, and one seldom attacked by ground game, owing to the extremely bitter character of the bark, contains more salicine than any other willow; its bark is said to be an excellent remedy against fever and is valuable as a tonic. This variety is useful for making fences by lacing long two-year-old cuttings into a trellis. A trellis grown in this way proved in a few years capable of great resistance, and, in addition, yielded a

very profitable crop each year. It was not damaged by the cattle eating the shoots. This variety invariably grows quite smoothly, thrives equally well under dry or wet conditions, and has never been known to take the blight. Shoots, 3 ft. to 7 ft. Plant 18 in. by 18 in. Makes a good light-colour buff, or brown. For binding purposes (as used by nurserymen) this is the best and toughest willow grown, and a certain cropper.

"Welch." This was a variety supplied by the U.S.A. Government in March, 1910, at which time it certainly differed from the above in the outward appearance of its bark; but, after being planted for eighteen months, the apparent difference, as in so many other instances, promises entirely to disappear. Shoots, 3 ft. to 7 ft. Plant 18 in. by 18 in.

"Pyramidalis" is a tall, slender rod, sent to Mr. Ellmore from Germany as one of their best, and classed by a German botanist of repute as *purpurea*—a doubtful classification, since it makes a good-colour white, which no English *purpurea* will do. Plant 20 in. by 20 in. Shoots, 5 ft. to 8 ft.

The three following sorts, viz., "Lumley," "Patent Lumley," and "American Green," were supplied by the U.S.A. Forestry Department in March, 1910, and are stated to be the best suited to Transatlantic climatic conditions. They gave in 1911 a growth of 4 ft. to 6 ft. under a very dry and trying season, and have escaped the green fly, with which the adjoining varieties were badly troubled, owing to drought. They are good croppers and hardy, but their value as white or buff is doubtful.

The variety known as "Africans," is the best of two kinds largely imported into England. It does not make the same long growth as in its native country. A rich alluvial clay is suitable. Shoots, 4 ft. to 7 ft., at Loughborough; 4 ft. to 10 ft. in its native climate. A very suitable and excellent willow for warm, humid places. Plant 20 in. by 20 in.

Salix alba var. *vitellina*.—The variety known as "Golden Willow" is one of the toughest willows grown if used with the bark on in a green state. It is chiefly sold for tie-rods to market gardeners, for which there is a most active demand at Covent Garden, Spitalfields, and in market-gardening districts generally. Strong, damp, rich soil is required. Shoots,

3 ft. to 6 ft. 6 in. If peeled, the colour is dirty and the rods poor in quality. Plant 20 in. by 20 in.

Salix alba var. *cardinalis*.—The "Belgian Red Willow" is the best working-quality willow that Belgium produces, but is far inferior to the *triandra* varieties; it is a heavy cropper, but the shoots rarely exceed 5 ft. 6 in., and they do not make a good colour as white; it finds a ready market with gardeners as green for tie-rods, and is well suited for that purpose. Its great toughness lies in the bark. Plant 18 in. by 18 in. on a damp loam soil.

Salix hippophaefolia.—This willow is classed as a hybrid of *Salix viminalis* and *Salix triandra* by the Rev. E. F. Linton. It is certainly one of the best and hardest-wooded full-top willows grown. Whilst growing, the largest rods have a tendency to throw out side-shoots; but as these are usually of a tender character, they fall away during the winter season or at peeling time. Of all the willows tried on sewage farms, this alone has stood the test of time, and yields a quality equal to many rods produced under ordinary conditions. For all work where a full top is desirable, it is probably unequalled.

In addition to the above there are other varieties, known in the trade as Violets from the beautiful bloom on the bark (*S. daphnoides*), White Dutch, Gelsters, Russets, Wigstons, and a few other old-fashioned but good working rods, all of which thrive, without much care, if conditions are suitable to their requirements.

Experiments with Potatoes Resistant to Wart Disease.

THE experiments which were conducted on the cottage gardens and allotments in 1910, to test the power of resisting Wart Disease believed to exist in certain varieties of potatoes, were renewed in 1911. The centres selected were as follows:—Ravenglass and Carlisle in Cumberland; Rainford and Haydock near St. Helens, and Ormskirk in Lancashire; Hooton and Saltney Ferry in Cheshire; Alfreton in Derbyshire; Annesley and Newstead in Nottinghamshire; Hales near Market Drayton, Smethwick, Walsall,

Burton-on-Trent, Stafford, and Stone in Staffordshire; Sutton Coldfield in Warwickshire, and Redditch in Worcestershire. Wart disease is known to have been present recently in all these places, and in most of them the allotments are badly infected and incapable of yielding a good crop from the susceptible varieties of potatoes that are usually grown. The potatoes tried this year were Aberlady Early, Snowdrop, Southern Queen, Sutton's Supreme, Sutton's Abundance, Chiswick Favourite, Davie's Laird, Sutton's White City, Crofter, and Provost, and small quantities were distributed to allotment holders on condition that the potatoes were planted on soil known to be infected. The results have been on the whole very satisfactory, and every one of the varieties proved to be disease-resistant as a rule. One or two exceptions were reported, but as the specimens were destroyed before the Board were notified, the accuracy of the statement cannot be verified. Conditions may conceivably occur under which these varieties may become diseased, but there is no doubt that in the vast majority of places infected with Wart Disease they can be grown with the certainty that they will yield a sound crop.

When replies were being collected as to the freedom of these potatoes from disease, opportunity was also taken to collect the opinions of the growers as to their cropping qualities and their general suitability to the district. The reports in this case are of a much more varied character.

1. *Ravenglass.*—The soil here is a rich clay loam, and the only manure used was from the farmyard. The gardens in which the potatoes were planted had been badly diseased for at least four years. In one case two tubers of Aberlady Early were said to be infected, and the crop and quality were both poor. The other varieties grown here were satisfactory both as to yield and quality.

2. *Carlisle.*—Davie's Laird, White City, Chiswick Favourite, and Abundance gave very good returns on well-manured land. The quality was very highly spoken of. The others gave good returns, except in one instance where the potatoes were planted on much impoverished soil. Southern Queen, under these conditions, appears to be susceptible to disease.

many years. Sutton's Supreme was described as poor in cropping capacity, but generally good in quality. Davie's Laird was poor in one case, but good in another. All the others were good, White City and Abundance being very good. A further experiment was tried at this centre to see if the seed saved from the former year would be resistant in 1911. White City, Langworthy, Conquest, and Abundance were tried and not only proved resistant, but gave very good crops. It was observed in this district that the disease was less evident as well as later in appearance in 1911 than 1910, except in those parts of the plant which were exposed to the air.

4. *Haydock*.—All the varieties tried, with the exception of Aberlady Early, were declared to be very good or good in yield, and satisfactory as regards quality. The exception was described as very poor, and unsatisfactory. The proportion of small potatoes was large.

5. *Ormskirk*.—The results varied a good deal, probably as a result of the treatment of the soil, but on the whole they were all satisfactory both as to yield and quality, except Aberlady Early, which was described as hard and not good to eat.

6. *Hooton*.—All the varieties, except Snowdrop and Favourite, were tried, and were reported to be quite satisfactory, except Sutton's Supreme, which is evidently unsuitable to the soil. It was given a fair trial by a grower who took second prize for his garden. In this trial Aberlady Early was described as very satisfactory in every way.

7. *Saltney Ferry*.—The yield in every case was poor owing to the drought, but the quality was considered good in every case. The same varieties should evidently be tried again another year.

8. *Alfreton*.—The drought affected the returns in this district also, all kinds of potatoes having been a comparative failure. Davie's Laird is apparently the best resistant potato for this neighbourhood, and White City the least satisfactory, but all the varieties should be tried again.

9. *Annesley*.—All varieties were reported to be satisfactory. Crofter is apparently the most suitable to the district, but Supreme is also good. A little ordinary potato disease was reported.

10. *Newstead*.—None of the tubers were large owing to the

dry season, and the crop was not as good as it probably would have been in a more favourable summer. The quality of Davie's Laird is highly spoken of.

11. *Hales*.—The potatoes were all planted in a badly diseased cottage garden, but owing to the drought no satisfactory deduction can be made, except that they are disease resistant. Seed saved from the varieties Conquest, Langworthy, and Golden Wonder, planted in a former year, was tried. Conquest is said to be not only a good cropper, but a beautiful eating potato. The tubers of Langworthy were small, owing to the drought. Golden Wonder was unsatisfactory.

12. *Smethwick*.—The abnormal season seriously affected the experiment as regards the yield, and the potatoes will be tested again this year, but with one possible exception they are declared to be very satisfactory. The order in merit is given as follows:—Abundance and Supreme (grand table quality, quite clean), Crofter (fine large potatoes, good quality), White City (good quality, slightly subject to scab *), Davie's Laird (fine potatoes, good quality, heavy cropper), Chiswick Favourite (good cropper, fine flavour), Southern Queen (fine large potatoes, good quality), Snowdrop (fine flavour, but subject to scab *), Aberlady Early (good quality, but subject to scab *), Provost (somewhat abundant, very small, and bady affected with scab *).

13. *Walsall*.—Great interest was taken in the experiment in this district, and many small experiments were made in addition to those arranged by the Board. Langworthy, Peacemaker, What's Wanted, and Milecross Early were also tried. The following report was sent in: "Our soils vary very much, as they consist of peat, semi-peat, clay, semi-clay, *i.e.*, clay and gravel, marl (marl and sand), almost complete sand, and the results have been as varied in crops as the soils. Our greatest misfortune has been the drought. The results may be summarised as follows: Aberlady Early, failure in crop, except in three cases, kitchen quality, varied. Golden

* Described by the Board's correspondent as Corky Scab, but the diagnosis has not been confirmed, and it is possible that the appearance may really be due to mechanical action of the dry gritty soil on the skin of the tubers. Many varieties are subject to this "Scab," especially in dry weather, but it is not caused by any disease

Wonder: this varied from moderate crop in newly ploughed land to complete failure in ordinary gardens, kitchen quality, good throughout. Langworthy, with the exception of four cases, a failure, kitchen quality, varied. These are improving in quality as the winter goes on. What's Wanted, pretty general throughout, about two-thirds the quantity of the susceptible varieties, kitchen quality, no complaint whatever. Peacemaker, a complete failure both in crop and quality. Provost, rather disappointing in crop, but all that can be desired for the kitchen. Our best all-round variety has been Abundance, which has been true in quantity and quality."

14. *Burton-on-Trent.*—The yield in every case was small, owing to the hot weather of the summer. Abundance appears to have given most satisfaction. Davie's Laird is apparently not suitable to the soil. The flavour of Aberlady Early was praised, but the tubers were small.

15. *Stafford.*—The late frosts in the spring affected the productiveness of many of the varieties, but White City and Abundance appear to be suitable to the district. Both Aberlady Early and Provost gave good results in some cases and bad in others. All the varieties should be tried again.

16. *Stone.*—Only two reports have been received. The yield and quality were unsatisfactory, and the varieties should be tried again.

17. *Sutton Coldfield.*—The abnormal season made the crop a very poor one, in some cases not more than one-third of the previous year's season having been secured. Several growers have kept all their crop for seed next season. Crofter was most highly spoken of. Supreme, Abundance, and Provost rank next. The quality of Aberlady Early was unsatisfactory.

18. *Redditch.*—The yield was generally poor, owing to the drought and want of manure. Southern Queen gave a good crop of a good quality. Davie's Laird gave a fairly good crop, but the quality was not so good as Southern Queen. Aberlady Early gave a good crop, but appears to be unsuitable to the soil. The flavour was soapy.

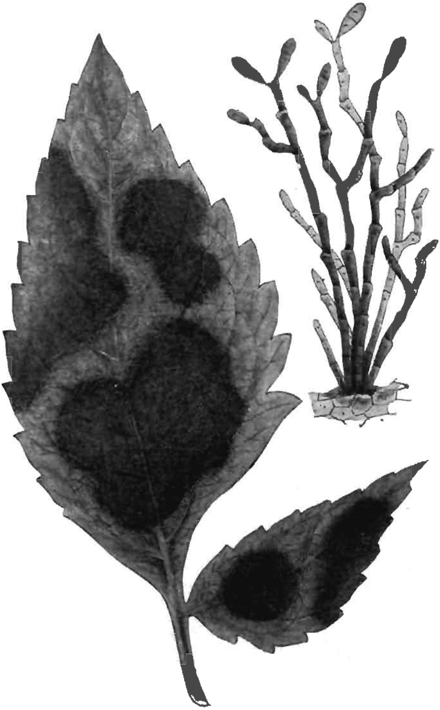
Tomato-Leaf Rust.

THE destructive disease known as tomato-leaf rust, due to the parasitic fungus *Cladosporium fulvum*, Cooke, was first described by Dr. M. C. Cooke, from specimens received from North Carolina in 1883.

Its occurrence in this country was recorded by Plowright in 1887, when it proved very destructive to tomatoes grown under glass, in two different districts. Curiously enough, the fungus was not observed as a source of injury to tomatoes in the United States until the year 1888. It is now a well-known pest, attacking tomatoes in France and Italy also.

The leaves, stem, and occasionally the fruit, are attacked. The fungus usually first appears on the leaves, in the form of small scattered spots, which gradually increase in size and encroach on each other, until almost the entire under-surface of the leaf becomes covered with a minutely velvety, dull rust-coloured layer, consisting of the spore-bearing portion of the fungus, the spawn or mycelium being imbedded in the tissues of the leaf. The presence of the fungus is first indicated by the appearance of pale yellowish patches on the upper surface of the leaf, corresponding in position to infected areas on the under surface. These yellowish patches increase in size, in proportion to the spread of the fungus on the under surface, and gradually change through brown to almost black, often with a tinge of purple. The fungus forms long, rust-coloured, afterwards blackish streaks on the stem, and more or less circular, scattered patches on the fruit. When the fungus shows a rusty tinge, the leaves wilt and soon die, and as a rule the disease spreads very quickly. This, to a very great extent, is due to the usual method of spraying horizontally, so that the spores are forcibly driven from one plant to another. If by any means the water could be allowed to fall from above, after the manner of a steady rain, numerous spores would be washed on to the soil, where they would germinate and perish, instead of being lodged on the leaves of healthy plants, where they set up new centres of disease.

Spraying with fungicides is of very little avail, unless commenced the moment the disease first shows on the foliage. The reason for this is that no fungicide is a curative agent;



Tomato Leaf Rust (*Cladosporium fulvum*, Cooke).

neither will it kill fungus spores. All that a fungicide can do is to form a film of some substance on healthy leaves, and act as a poison to any *germinating* fungus spores that happen to alight on the leaf. Success in this direction depends entirely on the method in which spraying is conducted, the object *being to cover the entire surface of every plant with the* fungicide. To accomplish this object even approximately, repeated sprayings are absolutely necessary.

If the *plants* are young, *half-strength* Bordeaux *mixture* may be employed. When flowers and young fruit are present, a solution of liver of sulphur, 1 oz. in four gallons of water, should be used.

Tenant Farmers and Changes in the Ownership of their Holdings.

A DEPARTMENTAL Committee was appointed by the President of the Board of Agriculture and Fisheries in March, 1911, *to inquire into the position of tenant* farmers in England and Wales on the occasion of any change in the ownership of their holdings, whether by reason of the death of the landlord, the sale of land or otherwise, and to consider whether any legislation on the subject is desirable.

The members of the Committee were:—The Right Hon. the Lord Haversham (Chairman); The Lord Clinton; Lord Ninian E. Crichton-Stuart, M.P.; Sir Frederick Cawley, Bart., M.P.; Sir Charles D. Rose, Bart., M.P.; Sir Edward H. Holden, Bart.; Mr. Colin Campbell, Chairman of the National Farmers' Union; Mr. Ellis W. Davies, M.P.; Mr. H. Trustram Eve, F.S.I., Secretary to the Farmers' Club; Hr. Howard Frank, F.S.I.; Mr. George Nicholls; Mr. Abel H. Smith; Capt. A. G. Weigall, M.P.; and Mr. James Parker, M.P.

The Committee have now presented a Report [Cd. 6030, price 4½*d*.], signed, subject to certain reservations in individual cases, by all the members except Mr. Trustram Eve, who has presented a separate Report. The Minutes of Evidence, Appendices and Index have been issued as a separate publication. [Cd. 6031, price 2*s*.]

Estates on the Market.—The Committee state that there is no doubt that an abnormal number of estates are being broken up and sold at the present time, and the Committee were

informed that agricultural land to the value of one and a half million pounds was disposed of during 1910, whilst in 1911 the value of the agricultural land sold exceeded two million pounds. Moreover, there seems every indication that the tendency to break up the large agricultural estates is likely to continue.

Causes of Increased Sales.—Among the causes to which this sale of estates was ascribed by the Committee are: (1) The feeling of apprehension among landowners (whether well founded or not) as to the probable tendency of legislation and taxation in regard to land. (2) The fact that in certain parts of the country land is at present let at rents below its present economic value. With a certain amount of increased agricultural prosperity, and the consequent demand for agricultural land for occupation purposes, landlords might be disposed to increase rents, but many find it preferable to sell. (3) Many agricultural estates are mortgaged more or less heavily, and at present prices a sale will often enable the vendor to pay off the mortgages and to retain an income in excess of what he has been receiving as owner of the land, and in other cases mortgagees are realising their securities. (4) The ownership of land entails heavy responsibilities, and, heretofore, landowners have in many cases been content with a comparatively small return on their capital, partly in consideration of the social position and amenities conferred by such ownership. Many owners, finding they are now in a position to sell to advantage, are relieving themselves of these responsibilities.

Position of Tenant Farmers on Occasion of Sale.—It is conceivable that on the sale of an estate the tenant may be placed in a very unsatisfactory position, and the evidence which the Committee heard proves that there exists great anxiety among tenant farmers, and that this feeling of insecurity is militating against agriculture.

For example, assuming that a tenant has to leave, he may lose a business connection such as a milk round, or a market for cheese, for which he may have built up a reputation. He has ascertained by experience the best method of working the farm which he is quitting, for another farm, the peculiarities of which he may take years to master. In addition, he may have succeeded in getting together a

number of useful farm labourers whom he will not be able to move to his new farm, whilst the greatest difficulty is that experienced by the tenant under present conditions in securing any other holding for occupation.

If the tenant elects to rent the farm under the new landlord, he is liable to be rented on any improvement which he has executed, without receiving any compensation. Unable to obtain another farm, he may perhaps agree to take the farm at an increased rent, at which he may not be able to farm profitably.

If to avoid dispossession the tenant decides to buy, he may be induced to bid at the auction up to a high price in order to retain his home, and, if he has executed improvements and farmed the land exceptionally well, the purchase price is often increased accordingly, with the result that he has to buy his own improvements.

Recommendations of the Committee.—The Committee make the following recommendations:—

(1) That the period of notice of intention to claim compensation for disturbance under Section 11 of the Agricultural Holdings Act, 1908, should be amended. At present the tenant is under an obligation to give notice in writing of his intention to claim compensation under the Section within two months of his receiving notice to quit, or being refused a renewal of the tenancy, and the Committee think that the early receipt by the landlord from the tenant of a notice of his intention to claim often has the effect of prejudicing the tenant in his negotiations with the landlord for a renewal of the tenancy. The Committee are of opinion that the landlord would be sufficiently safeguarded if the tenant were allowed to give notice of his intention to claim at any time up to a date two months before the determination of the tenancy, and the Committee recommend that legislative steps should be taken to amend the Act accordingly.

(2) That for the one year's notice required by Section 22 of the Agricultural Holdings Act, 1908, in the absence of agreement, for the determination of the tenancy of an agricultural holding, two years' notice should be substituted.

(3) That, except when notice to quit is given for one of the purposes referred to in Section 23 of the Agricultural Holdings

Act, 1908, or where the tenancy is for a period of twelve months or less, any agreement for notice to quit for less than twelve months should be made void by statute.

(4) That, in cases where a tenant receives notice to quit for the purpose of sale, the tenant should be empowered to serve a counter notice, claiming that the notice to quit shall not take effect until one year after the original notice would have expired. The Committee think that a tenant would thus be given time to negotiate with his new landlord or to make arrangements for obtaining another farm, and that this would go far towards removing any grievance under which the tenant labours at present.

(5) That the Small Holdings Act, 1910, should be amended to provide for payment of compensation for disturbance in all cases where land is actually acquired for small holdings, in addition to those cases where the tenancy is determined by a notice to quit given by the Council, or by a landlord at the request of the Council.

(6) That, if special legislation be enacted for Wales, effect should be given to certain recommendations of the Welsh Land Commission * as to compensation for improvements, unanimously adopted by them.

State-Aided Purchase.—(7) That a scheme of State-aided purchase should be instituted on the lines of a scheme proposed by Sir Edward Holden providing for the establishment of a Land Bank or Institution to lend money to the farmer to enable him to purchase his holding. It is proposed that the directorate of the institution should consist of representatives of three departments of the State—the Treasury, the Board of Agriculture and Fisheries and the Board of Trade—a member of the Government, an agricultural land agent, two practical bankers, and a practical farmer. In order to assist the institution in its transactions, it is suggested that an advisory committee consisting of two or three members should be set up in each of the different districts where land is likely to come into the market. It is recommended that the State should advance the sum of £500,000 to constitute the capital of the bank or institution, which will pay the State 3½ per cent. interest on the loan, this interest to be cumulative. The

institution will then lend to the farmer four-fifths of the purchase money, to be repaid by annual instalments spread over a period of 75 years, or such period as may be arranged between the purchaser and the institution. Additional money will be obtained when necessary by the issue of bonds to carry interest at 3¼ per cent. or such a rate of interest as would cause them to be taken up whenever issued.

State Purchase.—(8) In view of the experience of the Small Holdings Acts, and the strong desire which undoubtedly exists amongst farmers that they should remain tenants, it is probable that no large percentage will desire, or be in a position to avail themselves of, a scheme of State-aided purchase, and in these circumtances the Committee are of opinion that landed estates should be purchased and managed by the State, the farmers in this case being the tenants of the State.

In regard to the scheme of State-aided purchase (see recommendation (7) above), Mr. Parker states that he is entirely opposed to the recommendation, and Mr. Trustam Eve recommends in the place of Sir Edward Holden's scheme that legislation should be introduced at an early date to enable tenants to purchase their holdings by voluntary methods, from their landlords, by means of reducible mortgages, to be arranged by the State on the following plan:—

(1) The scheme to be confined to:—(*a*) Sitting tenants. (*b*) The son of a sitting tenant on nomination of the latter.

(2) The amount of the purchase money to be voluntarily agreed upon between the owner and sitting tenant.

(3) The State to advance the whole of the purchase money, which will be paid to the owner.

(4) The State may receive part payment of any amount, at the discretion of the tenant.

(5) The mortgage to be repaid over a period of years, and the interest to be 3½ per cent.

(6) The annual sinking fund to repay the capital to be based on the 3½ per cent. tables, and to vary in direct proportion to the number of years' purchase which fairly applies to the net annual value of the holding.

(7) No advance to be made by the State in respect of any proposed sale and purchase unless the Board of Agriculture certifies that the proposed purchase money is not in excess of the market value of the holding.

Lord Clinton, Mr. Campbell, Mr. Frank, Mr. Abel Smith, and Capt. Weigall dissent from the Committee's recommendation (8) in regard to State purchase, while Sir Charles Rose and Sir Edward Holden express the opinion that it should be limited to the acquisition of land for sitting tenants who are threatened with dispossession.

Mr. Frank and Capt. Weigall disagree with the recommendation (4) as regards the proposed counter notice and Messrs. Ellis Davies, Nicholls, and Parker state that, in their opinion, the tenant should be compensated for any improvement effected by him which has increased the letting value of the farm as an agricultural holding.

Jerusalem Artichokes as a Food for Stock.

The Board recently received an inquiry as to the food value of Jerusalem artichokes (*Helianthus tuberosus*) for cows in milk, and information relative to their value for live stock generally may prove of value to readers of this *Journal*.

Artichokes may usefully be given to cattle, horses, sheep, or pigs, and, under certain conditions, may prove sufficiently valuable for cultivation as a food for stock, especially perhaps in the case of pigs, and on poor soils. It occasionally happens that a quantity of artichokes may not be required for human consumption, and they may then be utilised to replace other roots in the ration of farm stock. McConnell says that the stems are sometimes cut while young for forage.

Value as a Food for Cattle.—Shaw * states that for cattle-feeding artichokes have much the same value as potatoes, and that they may be given in about the same quantities. He adds, "it is not probable, however, that they will ever be much grown as food for cattle because of the labour required in handling them for winter feeding, when they are more valuable relatively than at other seasons. They furnish good food for calves, for store cattle in winter, and for cows in milk, also for cattle that are being fattened, when they can be spared for such feeding."

It is stated by Kellner† that large quantities cause purging and make the milk watery.

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* Thos. Shaw *Feeding Farm Animals*, 1907, p. 336.

† O. Kellner, *The Scientific Feeding of Animals*, translated by W. Goodwin, [illegible]

Value as a Food for Pigs.—For the feeding of pigs, Coburn * says that Jerusalem artichokes are estimated as having approximately the same feeding value as potatoes, or a little more. In America the pigs are turned into the field to harvest the crop for themselves, and Coburn states that a crop of artichokes used as pasture should provide for eight or ten hogs per acre for three or four months, the length of time depending on the grain-food given. "Its worth, cost considered, has not been fully appreciated, perhaps because of the prevalent idea that, once established in the soil, its eradication is very difficult; but this is not necessarily a fact. . . . In the fall, when the tubers are grown, the hogs will do the harvesting." At the Missouri Agricultural College it was found that for pig-feeding one bushel of artichokes and three bushels of maize were superior to four bushels of maize.

In Bulletin 129, issued by the Ontario Agricultural College, it is stated that in some districts of Canada the crop is very popular as a food for pigs, that pigs are very fond of artichokes, and that the tubers have a little higher feeding-value than potatoes. At the Canadian Central Experimental Farm † one-sixteenth of an acre of artichokes was found to return a net profit in pork of $9.76 (40*s.* 6*d.*). The pigs received a grain ration of 1½ lb. per head per day of meal composed of one-half maize, and one-sixth each of oats, peas, and barley, and harvested the artichokes while still immature. The average gains of six pigs were as follows:—

Average weight, October 3rd	104 lb.	Average gain	33 lb.
,, ,, ,, 24th	137 ,,	,, Daily rate of gain	1·57 lb.

Potts ‡ says: "Few foods are more relished by pigs. The tuber in the raw state is very nutritious, more especially for pregnant sows, and also sows reduced in weight and condition after suckling and weaning big litters. . . . One acre will support twenty sows from four to six months."

At the Oregon Experiment Station ** six pigs were fed with grain, on one-eighth of an acre of artichokes, between October 22nd and December 11th. The pigs weighed from 117 to 215 lb., and consumed 3·1 lb. of grain for each pound of gain in live-weight, and as 5 lb. of grain alone is usually

* F. D. Coburn, *Swine in America*, 1909, pp. 168, 255.

† *Ann. Rept. of Exp. Farms*, 1900–1901, p. 94.

‡ H. W. Potts, "Feeding of Pigs," *Agric. Gaz. of N.S. Wales*, 1909, p. 276.

** U.S. Dept. of Agric., *Farmers' Bulletin*, No. 92, p. 20.

consumed per 1 lb. gain in live-weight, the artichokes saved nearly 2 lb. of grain for each pound of gain. According to the *Farmers' Cyclopædia of Agriculture* (1904), some trouble is occasionally experienced in getting pigs to eat the raw tubers.

Coburn remarks that the tops are seldom, if ever, eaten by pigs, but are considered excellent fodder for horses and cattle. He further says that the better health of pigs resulting from the addition to the ration of this fresh and succulent food is a matter of great importance, especially in animals which are kept for breeding. Throughout the experiment at the Oregon station the animals were noticed to be healthy and vigorous. Shaw suggests that the harvesting of the tubers is especially useful for brood sows, owing to the exercise necessarily obtained in the labour of rooting them out.

Value as a Food for Sheep.—For sheep, Shaw says that "store sheep and breeding flocks will be much benefited from supplementing the other dry food fed with 2 or 3 lb. of artichokes per day." Ordinary roots, however, are less costly to handle for sheep-feeding. In Australia the stalks are frequently used for feeding sheep or conversion into silage (Potts).

Value as a Food for Horses.—In regard to horses, Shaw says that tests have shown that artichokes are an excellent food, and have been given to the extent of making a reduction of 50 per cent. in the hay required, with results that were satisfactory. Magen found that the peasants in Southern France give artichokes to work-horses, and himself obtained satisfactory results with draft animals.* His opinion was that not over 12 litres (⅓ bushel) of chopped tubers should be given daily, and he mixed them with crushed grain and 10 to 15 litres (say ¼ to ½ bushel) of chopped hay. He found that when thus substituted for barley or oats for a hundred days no unfavourable results were noted. This ration is recommended as being very economical, both on account of the small value of the land on which the artichokes are cultivated and the ease with which the plant may be grown.

Artichokes may be given whole to all four classes of stock, but may usefully be sliced or pulped for cattle, sheep, and horses. They may be given raw or boiled. Stock do not

* *Exp. Sta. Record*, xviii. 1906 7, p. 764.

always take to them readily, but appear soon to relish them. Wolff says* that they are only occasionally employed as a farm food, while Kellner writes to the same effect. Sheep eagerly eat the leaves and tender parts of the luxuriant upper-growth.

Composition of Artichokes.—According to Wolff, the tubers contain more water and more albuminoids than potatoes, while they appear to contain as large a proportion of amides to albuminoids as turnips, and some determinations of amide nitrogen at Hohenheim gave results amounting to more than 40 per cent. of that of the albuminoids.

Kellner says that "the tubers of artichokes are closely allied to potatoes in composition, but instead of starch they contain other carbohydrates—lævulin and inulin—and slightly more water."

Potts gives the following average composition of artichokes compared with potatoes:—

	Water.	Ash.	Protein.	Carbohydrates.	Fat.	Nutritive Ratio.
Artichokes ...	79·5	1·0	2·5	16·7	0·2	1 : 7
Potatoes ...	78·9	1·0	2·1	17·9	0·1	1 : 8·6

Behrend's experiments † showed that artichokes contained about as much dry matter (16·07 to 25 per cent.) as sugar beets, and rather more water than the best types of potatoes. Raw protein varied between 3·31 and 10·73 per cent. of the dry matter—rather more than in sugar beets, but below that in potatoes; the proportion of fibre approximated to that in potatoes, while, as in other tubers and roots, the fat content was very small. The proportion of the dry matter soluble in water was very high—80 to 90 per cent.—and from this Behrend argued a high digestibility of the tubers, and thought that this might account for the good results obtained in the feeding experiments conducted with artichokes. Tubers stored for three or four months in a cool cellar, from spring to August, were found to keep well, though they dried somewhat, and were consequently richer in dry matter.

Cultivation of Artichokes.—Artichokes grow to best advan-

* E. V. Wolff, *Farm Foods*, translated by H. H. Cousins, 1895, p. 210.

† *Zeitschrift für Spiritusindustrie*, 9 June, 1904, as abstracted in *Bulletin Mensuel*, 1904, II., p. 922; also *Journal für Landwirtschaft*, 1904, p. 127.

tage on good, well-drained loamy soils such as are most suitable for potatoes; they will, however, give very fair yields on the poorer sandy soils, on gravels, and on peaty soils, but are not so suitable for heavy land. They respond at once to manuring and cultivation. They are very hardy to frost, and will give fair yields several years in succession on the same ground. For all these reasons artichokes may usefully be planted on odd or waste patches of land on the farm, and may be continued from year to year by leaving a few tubers in the soil. In Wilson's *Farmer's Dictionary* it is stated that the plant grows well under shade, "it can be cultivated in woods and half-waste grounds; it is sometimes planted in English woods, and left to propagate itself, in order to afford shelter to game; and it might very advantageously be raised on semi-barren or exhausted soils as food for stock." The American *Farmer's Cyclopædia of Agriculture* (1904) states that the plant will thrive and produce abundantly on light sandy or gravelly soils, too poor for many other crops, the main requirement appearing to be a dry soil. If the soil is wet the tubers rot. The plant is resistent to drought, and as a rule remarkably free from insect or fungus pests. The stems grow very tall (up to 10 ft. in height) and the foliage is plentiful, and the dense shade during the summer months tends to the suppression of all weeds on the ground occupied by the crop.

In planting artichokes the land may be ploughed and ridged as for potatoes, manuring in the same way if desired, planting the tubers 18 in. apart in the rows, with 30 in. to 36 in. between the rows. From 12 to 15 cwt. of tubers per acre are necessary. When once established, planting every year is unnecessary, as the small tubers left when the crop is raised will produce a sufficient number of plants. Planting may take place in autumn or spring. The best and most shapely sets should be planted, particularly when intended for human consumption. Hoeing should be continued until the plants are 2 ft. to 3 ft. high. The crop of tubers may be utilised from October onwards, but they are generally left in the ground until spring and dug up as required. Frost does not injure the tubers if they are allowed to thaw in the ground. The yield of tubers at the Oregon Experiment Station was 740

bushels per acre (or, at 45 lb. per bushel, no less than about 15 tons), and is given by Potts as averaging 7 to 8 tons, the white and pink varieties when tested having yielded 9 tons 1 cwt and 6 tons 16 cwt. respectively. McConnell gives the produce as 3 to 8 tons per acre, and, as a rule, the weight of crop obtained is probably less than that of potatoes on similar soil. In Wilson's *Farmer's Dictionary* already referred to, it is stated that, "In Alsace, Jerusalem artichokes are always grown, without any rotation, and with manure only every second year, upon the same land. At Bechelbronn, upon somewhat shallow soil, they produce per acre 10 tons of tubers and 11½ cwt. of dried stems; and in many situations, upon land of medium quality, and without any manure, they produce per acre about 500 bushels of tubers. The leaves and stems are used on the Continent as both green and dry fodder." According to the American *Farmer's Cyclopædia of Agriculture* (1904) the yield varies from 275 to 1,000 bushels per acre.

Night Frosts in Spring.

THE various means by which fruit trees may be protected against late spring frosts have from time to time been dealt with in this *Journal*,* and it may at this season be useful to call attention to some notes on the subject of night frosts in spring prepared for issue by the Meteorological Office two or three years ago. The notes have been embodied in a chapter on the subject in *Forecasting Weather*, by the Director of the Meteorological Office (Constable & Co., Ltd.).

Causes of destructive Frosts in Spring.—Destructive frosts in spring may arise from three separate causes: (1) the occurrence of the ordinary type of cold, wintry weather which is not uncommon in spring, there being a northerly, north-easterly, or easterly wind, indicating a cold spell, probably with snow. (2) Changeable April weather, which can be referred to the passage of barometric depressions: if the baro-

* Previous notes on the subject have appeared in the *Journal* as follows: April, 1906, p. 57; June, 1906, p. 184; Sept. 1906, p. 375; April, 1907, p. 23; Oct. 1908, p. 521; March, 1910, p. 1024; Oct. 1910, p. 558.

meter and wind are watched, it will be noticed that after rain, with a falling barometer and a southerly or south-westerly wind, the wind veers to the west, north-west, or north, and becomes apparently drier, and the weather clears and becomes cold. If this change occurs towards evening, and the wind drops when the sky clears, a frosty night is almost certain. (3) The third recognised cause refers especially to night frosts, which may occur with destructive effect if the night is clear, even after a warm sunny day, and the destruction is more complete if the day which follows the cold night is itself sunny and warm. The most destructive frosts occur when the causes here noted as the second and third combine, when cold, clear weather, with a calm night, follows a boisterous day, with a veering of the wind to the north-west or north.

During clear weather the day temperature is increased by the warm sunshine, but the night temperature is lowered. After the sun is gone, and when the earth and its covering herbage are exposed to a clear sky, they lose heat and get colder than the air. They may cover themselves with dew or hoar frost, this being a sure sign of their having been cold. In turn they cool the air next to them, and the cooled air in its turn trickles like water downhill to the valleys.

In these circumstances the plants on the tops of the hills are fortunate, for the air which replaces that which has been cooled and has trickled away is practically part of the original undisturbed supply and is comparatively warm. The plants on the hillside get the air which trickles down from above, and which is consequently colder than that enjoyed by the plants at the top. The cooling goes on as the air flows down to the valleys. But the worst fate awaits the plants in the valleys, where pools of cold air form. Thither the coldest air gravitates, and for the plants at the bottom the air is stagnant; consequently they may cool by exposure to the open sky.

The effects of this process of cooling may be very different in situations which are quite near to one another. Meteorologists are accustomed to note such effects by having one thermometer "on the grass," supported on a couple of forked twigs close to the ground, and another "in the screen," which means that it is kept in a louvred box at a height of four feet from the ground. On calm, clear nights the effect of the

protection of the screen is very striking. The differences are not altogether due to enclosure in a screen; the height of the screen above the ground has something to do with it, because the trickling stream of cold air keeps to the ground, and is often not very thick.

Distribution of Temperature during Night Frosts.—The following conclusions regarding the distribution of temperature during frosts on calm nights are well established:—

(*a*) The frost becomes more severe as one goes from the hills down to the valleys. Hollows on the hillsides are colder than the more exposed parts.

(*b*) The frost is most severe at the ground, and becomes less severe at shrub height, still less so at tree height, so that herbage and low shrubs may be destroyed when higher shrubs and trees are spared.

(*c*) An overcast sky or a light wind generally prevents ground frosts.

It is also a well-established meteorological fact that, on the average, wind falls off in the evening, and in settled weather a calm night often follows a day with a good breeze. This is especially the case with an easterly wind.

Forecasts of Spring Frosts.—Referring to the three causes described above, the first two are easily associated with general meteorological conditions over the country, and to anticipate them forms part of the ordinary duty of weather forecasting. The changes are often very sudden, and while it is, as a rule, possible to anticipate their general character, it is less easy to form an estimate of the intensity of the changes. The difference between the changes which produce only a chill and those which cause a frost is not indicated on the maps used for forecasting.

The frosts of calm nights are still more difficult to deal with by forecasts issued from a central office. They are subject to the effects of local peculiarities of site and circumstances of which account can only be taken by those who are on the spot. A light air, hardly strong enough to be called a wind, will keep away a night frost by preventing stagnation; a calm, on the other hand, favours frost, but from the point of view of the weather forecaster the calm may be an artificial calm due to surrounding trees or buildings, and not at all due to what he would understand by the weather.

It has already been pointed out that situation, whether on a hill or hillside, or a valley, is also of importance. It is, therefore, necessary that persons interested in protecting their crops from frost should make use of their local knowledge in extension of the information to be obtained from forecasts.

One of the best aids to the use of local knowledge is the regular study of weather maps. The Meteorological Office issues daily charts of the weather over the British Isles and North-western Europe, which can be had by anyone on payment of the cost of postage and covers (£1 per annum), and the conditions for the occurrence of frosts can be watched much more effectively by an examination of the daily map than by the mere consultation of the forecast which is drawn up for a whole district and must be limited to about a dozen words.

Further information about the probability of a night frost may be got from local observations of the temperature and humidity of the air. From readings of the dry and wet bulb thermometer on any occasion, the so-called "dew point" of the air can be computed. The dew point is the temperature at which dew begins to form.

It has been supposed that on a calm night the air cannot be cooled far below the temperature of the dew point of the previous evening, but this is not the case. All we can say is that the loss of heat is checked when the temperature falls to that of the dew point. The following cases combine to bring about this result:—(*a*) While the temperature is above the dew point evaporation is proceeding from the ground and from herbage, and causes a loss of heat from them in addition to that due to exposure. Below the dew point this additional loss of heat does not occur. (*b*) If exposed surfaces are cooled below the dew point, moisture condenses on them in the form of dew (or hoar frost), and in the process a certain amount of heat is liberated from the condensed moisture, which in part balances the loss of heat due to exposure. (*c*) The cooling of the air may result in the formation of mist which, acting as a screen, checks a further fall of temperature. Destructive frosts on calm nights are thus more likely when the air is dry, that is, when the dew point is far below the air temperature, or the wet bulb is far below the dry, than on nights when

it is moist or the dew point and wet bulb temperatures are near the dry.

Practical Hints in Forecasting Frosts.—From what has been said above, it will be gathered that anyone who is interested in protecting his crops from night frosts, and, therefore, wishes to know beforehand when frosts are likely to occur, will do well to study :—

(1) The peculiarities of his locality to know whether from being in a cup or valley it is specially liable to frosts on calm nights.

(2) The daily charts, with or without forecasts by telegraph, in order that he may recognise the meteorological conditions in which the weather is likely to become cold and calm.

(3) The readings of the dry and wet bulb thermometers so that he may recognise the occasions when ground night frosts are likely to be severe on account of the dryness of the air.

*Protection against expected Frosts.**—The best method of protection for young plants against night frosts is to cover them up and thereby prevent first of all the loss of heat, and secondly the access of cold air.

Other means of protection have been tried. Saturation of the ground in which the plants are growing with water is resorted to in fruit plantations in California. Possibly the evaporation of the water is in itself a protection, as it promotes the formation of a mist over the land to be protected, but the warmth of the water itself no doubt also acts to prevent the air just above it being cooled as much as it would have been if the ground had been dry. On the other hand, Continental writers point out that delicate plants are more sensitive to the effects of frost when their cells are fully charged with water than when they are in a dry condition, and the adoption of this method, though mitigating the intensity of frost, may therefore lead to increased damage to the crop. Possibly differences in the character of the crops to be protected, more particularly the heights of the sensitive parts above the ground, may account for the apparent differ-

* For an account of methods other than those mentioned in these Meteorological Office Notes, see the previous numbers of the *Journal* already referred to.

ence of opinion. On occasions when there is an appreciable breeze, saturation of the ground is probably harmful, as it would promote increased evaporation, and so lead to cooling, while the protecting mist would be dispersed by the breeze as rapidly as it was formed.

Vegetation suffers most when the plants are rapidly warmed by the sun after being exposed to frost, so that protection is useful in the early morning when the sun is rising.

The Packing of Butter for the South Wales Markets.

THE Board of Agriculture and Fisheries desire to call the attention of farmers and others supplying butter to the markets of South Wales to the following resolutions as to the packing of butter which have been generally adopted by the Grocers' Associations of South Wales principally concerned in the trade in farmers' butter.

1. *That the present practice of packing Welsh butter in old boxes of various shapes and sizes prevents Welsh butter from obtaining the price in the markets of South Wales to which it is otherwise entitled, and is detrimental to the interests of makers of, and also of those who deal in, Welsh butter.*

2. That the members of the Grocers' Associations of South Wales should require Welsh butter, purchased by them, to be packed as follows:—

3. All butter consigned to grocers and provision dealers in South Wales and Monmouthshire by Welsh farmers should be sent only in tubs or casks of the traditional shape.

4. No butter should be consigned in a tub or cask used previously for any purpose whatever.

5. The tubs or casks should be of 40, 50 and 70 lb. capacity, the wood being well-seasoned white wood, planed smooth, free from knots and all defects and from odour and resin, the edges being either planed or cut with a fine saw.

6. The staves should be about 7/16 in. thick, and each tub should be bound with three galvanised iron hoops or rods, which are recommended as being practically proof against rust caused by brine.

7. Before being packed with the butter the tubs or casks should be steamed or thoroughly scalded with boiling water and afterwards allowed to cool. They should then be carefully lined with parchment paper of the best quality. This paper should be neatly rolled and placed in scalding brine the night before it is used, and allowed to remain in the brine until next morning, when it will be cold and ready for use.

8. In filling up the casks small quantities only should be put in at a time, and the butter should be made firm and solid by being well pressed with a heavy wooden packer from the centre outwards, so as to exclude all the air.

9. At the top of the tubs no space should be left, and the butter should be covered with parchment paper and also a piece of muslin.

10. In nailing the lids care should be taken that the nails do not protrude inwards, as otherwise the butter is liable to be damaged when it is turned out.

11. To prevent the packages becoming dirty in transit and also to preserve the butter in hot weather, the casks should be wrapped in canvas covers.

12. In order to distinguish Welsh butter from other kinds it would be an advantage that the tubs or casks should be branded by means of an inexpensive printing brand with the words, in English, "Welsh butter."

Helianthi as a Food for Stock.

A new fodder plant, a cultivated form of the plant *Helianthus macrophyllus*, has been sold during the last three or four years under the name of "Helianthi," "Helianti," or "Salsefis." It is a perennial species of Helianthus, allied to the sunflower and Jerusalem artichoke, but produces tubers that differ from those of the Jerusalem artichokes in being slender and spindle-shaped. The plant is remarkable for its enormous production of tubers and generally luxuriant growth. The stems above ground grow as high as 9 or 10 feet, and may be used as fodder, either green or as hay or silage. If the crop is not cut for fodder the growth matures and then dies back, while a heavy crop of tubers is produced, which may be fed to horses,

cattle, pigs, or sheep. They are also said to be superior to Jerusalem artichokes for culinary purposes. Up to the present no report of trials of the plant as a field crop in this country is available, but an article in the *Mitteilungen der Deutschen Landwirtschafts-Gesellschaft* (October 28th, 1911) calls attention to the value of the Helianthi as forage plants.

According to analyses made by Professor Dr. Küster of Müncheberg, the composition of the green fodder is as follows:—Water, 68·0 per cent., protein 3·5 per cent., fat 1·0 per cent., carbohydrates 17·5 per cent., while the dried leaves contain protein 13 per cent., fat 2 per cent., and carbohydrates 48 per cent. These figures show greater feeding values than either clover or lucerne, assuming that all are similar as regards digestibility and suitability for stock, the composition of the latter being as follows:—

	Clover (green). Per cent.	Clover (hay). Per cent.	Lucerne (hay). Per cent.
Protein	3·3	12·3	14·4
Fat	0·7	2·2	2·5
Carbohydrates ...	7·0	33·2	28·0

The tubers of the plant contain a substance (inulin) akin to starch, which is of value for feeding purposes, and they are also quite palatable and suitable for use as a vegetable.

No special soil or situation is apparently needed for the cultivation of the plant, but it is preferable that land which can be permanently assigned to the crop should be selected, owing to the difficulty of eradicating the plants. As a rule, the plant is not propagated by seeds but by tubers, as in the case of potatoes. If left to grow undisturbed, a thick bush is in time formed.

SUMMARY OF AGRICULTURAL EXPERIMENTS.*

SOILS AND MANURING.

Sewage Sickness in Soil and its Treatment by Partial Sterilisation. *Dr. E. J. Russell and Mr. J. Golding. (Jour. Soc. Chem. Indust., April 29th,* 1911).—The method known as the land purification of sewage consists in allowing the sewage to drain through soil which retains most of the fertilising material. By the agency of bacteria this decomposes, and is utilised by crops grown on the land, giving some financial return for the treatment. The system, however, has the serious disadvantage that the soil gradually becomes "sewage sick," in which state its efficiency as a filter is low, and the effluent consequently impure.

A soil in such a condition has to be rested for a longer or shorter period, in which time no sewage can be run on it.

To some extent this "sickness" is due to physical causes. Owing to the continuously wet condition of the soil receiving sewage, the clay—of which there is some in even the lightest soils—gradually becomes deflocculated or more gluey in its consistency. Drainage is retarded, and the amount of air in the soil is too little to meet the requirements of the bacteria which bring about the decomposition of the organic matter.

The authors, however, show that the bacteria, and consequently the decomposition, are affected in another way.

The fact has been established that even in an ordinary soil there is some factor that keeps down the number of useful decomposition bacteria, and the experiments of Russell and Hutchinson indicate that this factor consists of larger organisms, probably protozoa.

These larger organisms are more readily killed than are bacteria; by heating the soil or treating it with antiseptics they may be completely destroyed, while many of the useful bacteria survive, and afterwards develop at a very rapid rate, with consequent rapid liberation of available plant food and improved growth of crops.

From their experiments, carried out at the Kegworth Sewage Farm, the writers conclude that one of the causes of sewage sickness is the great increase in the number of the injurious organisms, owing to the specially favourable condition of a soil treated with sewage. When soil from the farm was partially sterilised by heating, or by treatment with toluol or carbon disulphide, the number of bacteria after a short time rose greatly (in some cases to more than ten times that observed in untreated soils), with correspondingly rapid decomposition of organic matter in the soil, and recovery from sewage sickness. Analysis of the effluents showed that treated soils were more effective as filters, and did not so quickly lose their efficiency.

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* A summary of all reports on agricultural experiments and investigations recently received is given each month. The Board are anxious to obtain for inclusion copies of reports on inquiries, whether carried out by agricultural colleges, societies, or private persons.

The writers suggest that it may be possible to apply the method on a large scale either by adopting the old agricultural practice of "paring and burning," or by the injection of cheap volatile antiseptics into the soil with suitable mechanical apparatus.

Renovation of Poor Pasture Land (*Lancs. C.C. Educ Com., Agric. Dept., Farmers' Bulletin No.* 22).—This experiment was commenced at four centres in the county of Lancaster in 1906. Five half-acre plots were chosen at each centre, the plots receiving the following dressings per acre:—1½ tons cob lime, 1 ton ground lime, 10 cwt. basic slag, 5 cwt. superphosphate + 7 cwt. ground lime, and 5½ cwt. boiled bones. Half of each plot received an additional dressing of 4 cwt. per acre of kainit. In January, 1908, a further application of the same manures was given to each plot. As a subsidiary part of the scheme of renovation, a strip of land on each side of the central line dividing the two halves of each plot was sown in April, 1906, with white clover seed, though the seeds were neither harrowed in nor covered with soil. In addition to the preceding group of centres, further plots were subsequently laid down at two other centres. At the first of these, plots were manured as above described, a sixth plot being added which received 5 cwt. superphosphate and 10 cwt. ground limestone. At this centre the white clover seed was covered with soil on part of each plot. At the remaining centre no clover was sown; in each case the dressings of ground lime were replaced by increased quantities of ground limestone.

No precise information was obtained during the experiment as to the financial advantages resulting from the treatment, as the plots were not fenced off, and stock grazed over the fields at will. A detailed account is therefore given in the report under notice of the improvements which were observed at each centre separately, and the authors of the report, Dr. T. Milburn and Mr. R. C. Gaut, draw the following conclusions from the results of the experiment as a whole:—

(1) Much of the poor pasture land in Lancashire which, although doubtless satisfactorily under-drained, is covered by inferior grasses, is capable of being not only improved, but converted into good sound grazing land.

(2) The method of improvement adopted need not necessarily be a costly one, the most important question being to decide as to the kind of material it is essential to employ.

(3) There are reasons for believing that the second dressing given in 1908 to the plots at the four centres, where the trials were commenced in 1906, was unnecessary.

(4) Lime gave decidedly satisfactory results at one centre only. As a rule, whether the dressing used was one of cob lime, ground lime, or ground limestone, it effected only a slow change in the character of the original herbage.

(5) Phosphatic manures proved the most effective agents in improving the value of the pasture, and gave, on the whole, excellent results.

(6) All the phosphatic dressings used (basic slag, super-lime, boiled bones) did uniformly well, and there was practically nothing in the results at the different centres to show that one was superior to another.

(7) Potash, added to either a dressing of phosphates or lime, did not effect any marked improvement, though its effect upon the

feeding value of the herbage remains an undetermined factor which must not be overlooked. It is extremely doubtful whether in this experiment, kainit was profitably employed, though it should be remembered (and also when reading No. 6 conclusion) that no trial was carried out on typically light land.

(8) The effects of the dressings, even where they were applied several seasons ago, are not yet exhausted.

(9) Several factors affect the speed at which improvement is brought about, among the most prominent being :—

(*a*) The character of the season that follows the application of the manures.

(*b*) The attention which is paid to grazing the herbage.

(10) At one centre, where the pasture was covered with a stubborn herbage composed mainly of mat-grass and sheep's fescue, none of the dressings effected any material change.

(11) Sowing seed of white Dutch clover as a means of bringing about a speedy improvement in a poor pasture was not justified.

In an appendix to the report, the results of a test on ordinary arable land with wild white clover are described. When sown in a seeds mixture it proved much more permanent than the ordinary cultivated variety of white clover.

Manuring of Grass Land (*Univ. Coll., Reading, Dept. of Agric. and Hort., Bull.* xi-ii, 1910).—Plots were laid down at nine centres in Oxfordshire in 1909, to test the effect of various manures and combinations of manures on grass land. In most cases the grass was mown in 1910, and the bulletin gives particulars of the weights of hay obtained in that year, together with notes on the character and quality of the herbage on the different plots at each centre. The experiment is being continued, but from even two years' results it is clear that the manure or the mixture of manures which is likely to answer best at one centre is not necessarily the best at another centre. A dressing of a phosphatic manure gave profitable returns at most centres, and the addition of potash and nitrogen further increased the yield.

Manuring of Grass Land (*Univ. Coll., Reading, Dept. of Agric. and Hort., Bull.* xiii., 1910).—The scheme of manuring in this experiment is the same as that in the one mentioned above. Plots have been laid down at eighteen centres in Bucks, five years' results having been obtained from two centres, and four years' results from eight centres. Full particulars of the weights of hay obtained up to the present, together with analysis of the soil at each centre, are given in the bulletin.

Manuring of Poor Hill Pastures (*Somerset C.C., Report of the Agric. Instr. Com. for the period ending March 31st,* 1911).—Experiments to test the effect of basic slag, superphosphate, lime, and kainit are being carried out at four centres in Somerset. A distinct improvement is noticeable on the plots receiving slag and superphosphate. So far the ground lime and kainit have given little or no result.

Manuring of Meadow Land (*Monmouthshire Educ. Com., Rept. of Director of Agric. Educ., October 18th,* 1911).—This report gives the results of trials with artificial manures carried out on three different soils since 1909.

Manuring of Hops (*Rept.*, 1911, *by Dr. Bernard Dyer*).—These experiments deal chiefly with the use of nitrate of soda for hops. The land, at Hadlow, Tonbridge, is old hop ground, replanted in 1894, and the hops are "Fuggles." In 1895 all the plots were limed and dunged, but no more dung has been given except on the continuously dunged plot. Phosphates and potash have been used each year, 8–10 cwt. of superphosphate and basic slag in alternate years, and 2 cwt. of sulphate of potash. The nitrate of soda has been applied on different plots in quantities from 2 cwt. to 10 cwt. per acre, usually in dressings of 2 cwt. per acre at about monthly intervals from January to May. The principal results, taking the average crop in the sixteen years, 1896–1911, are as follows (per acre):—

Manuring.	Average Crop. Cwt.
Phosphate and potash	10½
,, ,, and 2 cwt. nitrate of soda	13½
,, ,, and 4 cwt. ,, ...	15½
Thirty loads (15 tons) London dung	14¾

Applications of greater quantities than 4 cwt. of nitrate of soda have given very slight increases of crop for the extra quantity. Samples from each plot have been submitted to chemical analysis for determination of the resins and estimation of the value of the hops, and to merchants and factors in the Borough, and no difference has been found between the hops grown with chemical manures and those grown with dung. Dr. Dyer concludes that even when the soil is liberally manured by autumn or winter dressings of dung, rape dust, fish guano, &c., 4 cwt. per acre of nitrate of soda applied early in the spring may be regarded as a safe and profitable dressing for hops, even in a wet season, phosphates being used liberally at the same time, and also potash salts if the land requires potash.

Manuring of Swedes (*Univ. Coll., Reading, Dept. of Agric. and Hort., Bull. x.*, 1910).—The results of experiments carried out at five centres in Oxfordshire in 1910 are given. Superphosphate, steamed bone flour, and basic slag were compared with one another, both singly and in combination with sulphate of potash and sulphate of ammonia (except in the case of basic slag, when the sulphate of ammonia was replaced by nitrate of soda). The results obtained at the different centres varied a good deal, the deciding factor evidently being the amount of lime in the soil. Where a sufficient quantity of lime was present, superphosphate gave the most profitable results. With soil deficient in lime, slag gave better results. Compared with the other manures, steamed bone flour proved a failure. The addition of a nitrogenous or potassic manure to the phosphate in most cases increased the crop, but not always to such an extent as to make the addition profitable. It is, however, pointed out that in most cases the land was in good condition, and on poorer soil the application of the other manures, in addition to the phosphates, might have given more profitable returns.

Dry Farming in Hungary (*Internat. Inst. of Agric., Rapport sur le Dry-Farming système Campbell*, 1911, p. 52).—A paper in this publication describes the results of a trial of the Campbell system of cultivation at Debreczen, in Hungary, on the conservation of water in the soil.

The rainfall during the twelve months from September, 1909, to August, 1910, amounted to 22½ inches. The trial started in the autumn of 1909, when a plot of rye stubble was left untouched for comparison with other plots which were disc-cultivated and ploughed in autumn, and cultivated and harrowed in the following spring. The amount of water in the soil of the two plots was determined at intervals, and was considerably greater in the case of the cultivated land. On May 6th, about the time when tobacco was planted, the cultivated soil contained 15 per cent. of water at a depth of 24 in., and 14 per cent. at 39 in., while the uncultivated soil contained 10 per cent. and 7 per cent. respectively. On June 28th, after the tobacco had been using the soil moisture for six weeks, the content of water was 13 per cent. at 24 in., and 12 per cent. at 39 in., but in the uncultivated soil it was only 5 per cent. at 24 in., and 4 per cent. at 39 in.

Trials with the Campbell soil-packer were carried out in 1910, after the usual thorough ploughing and cultivation of the "dry-farming" system, with uniformly favourable results on cereals, potatoes, and forage crops.

FIELD CROPS.

The Growth of Sugar Beet (*Somerset C.C., Report of Agric. Instr. Com. for the period ending March 31st,* 1911).—Sugar beet was sown at six centres in Somerset in 1910 alongside mangolds, the two crops receiving exactly the same treatment except that the beet was left closer in the drills. The average weight of beet was 16 tons per acre, as compared with 40 tons of mangolds per acre. The composition of the sugar beet at the different centres is given, and the conclusion is drawn that heavy manurial dressings tend to depress the percentage of sugar in the beet. The average amount of sugar in the roots was 16 per cent.

Effect of Soil and Climatic Conditions on the Composition of Wheat (*Univ. of California, Agric. Expt. Sta., Bull.* 216).—The writers of this Bulletin point out that there is a wide difference of opinion as to the factors which influence the composition of wheat. Generally speaking, variety, climate, and soil are regarded as the most important, though different investigators place different values on each. The experiments of which an account is given in this Bulletin were designed to throw light on the question.

In a series of preliminary trials the following conclusions were arrived at:—

1. Wheats of the same variety when grown in the same locality and under the same conditions vary but little in composition, even though the seed differs widely in physical and chemical characteristics.

2. Wheat of the same variety and absolutely uniform in other respects, if sown in different localities with different climatic conditions yields crops of widely different appearance and chemical composition.

3. Soil and seed [this apparently does not refer to variety but to general character] appear to play a very small part in influencing the composition of wheat.

These all suggest that climate is the principal factor affecting the nitrogen content of wheat.

In order to test further the effect of soil on the nitrogen content

of wheat, soils of widely different types were obtained, and small plots made with them at the experiment station, thus eliminating the influence of climate. The experiment has been carried on for three years, and two varieties, one a "high protein" wheat, the other a "low protein" one, have been tried.

Analyses of the soils and crops are given. From the results it seems quite certain that the soil nitrogen has very little, if any, direct influence upon the nitrogen content of grain grown upon such soil, and that some climatic factor is sufficient to overshadow the soil factor entirely. Further, it appears that the nitrogen content of an original seed, when grown elsewhere than in a climate to which it has been acclimatised, has little or no influence upon its progeny. For instance, the original seed which had been produced on Kansas soil in Kansas, and which contained 3·04 per cent. of nitrogen, when grown on Kansas soil in California produced wheat containing only 1·91 per cent. of nitrogen.

In an addendum dealing with the 1911 crops, the conclusion is again emphasised that "the climatic factor is the chief one in producing changes in the chemical composition of wheat."

Varieties of Wheat (*Somserset C.C., Report of Agric. Instr. Com. for the period ending March 31st, 1911*).—A test with several varieties of wheat was carried out at one centre in 1910, with the special object of comparing some of the new French wheats with older varieties. The wheats were sown in November, but the French varieties failed to come up, and had to be resown in spring. Notes on the quality of the different samples of grain are given, in addition to the weights of grain and straw per acre.

Milling and Baking Tests with Wheat (*Kansas Agric. Coll. Expt. Sta., Bull. 177*).—This Bulletin describes at great length attempts to trace the connection between the chemical composition of wheats and flours, and their milling and baking qualities. Much attention has been given to the control of the milling and baking tests so as to improve them in regard to the uniformity of their results.

The work done shows that baking results are influenced very greatly by a large number of details, such as variation in the amount of water or yeast used, differences in the extent of the rising, in the working of the dough, in the fineness of the flour, in the initial temperature of baking, &c.

Detailed analyses of about sixty wheats, with the results of milling and baking tests, are given.

Heating of Hay Stacks (*Arb. der Deut. Landw. Gesell., Heft 196*).—Investigations which have been carried on on the Continent with regard to the heating of hay stacks seem to have resulted in some differences of opinion as to the nature and cause of the changes that take place. This publication contains an account of experiments carried out by Dr. Hugo Miehe at the Botanical Institute of the University of Leipzig, and the results are compared with these obtained by previous experimenters.

Dr. Miehe states that it is highly probable, when the grasses are not quite dead, that the first rise in temperature of the hay can be ascribed to the respiration of the living plants which is increased on account of the wound caused by cutting. He found no absolute

proof of this, however, since he was not able to obtain living pieces of grass free from bacteria. The action of the living plant must be restricted to the initial stages of heating, since grass is killed at a temperature of 40° to 45° C., whereas the temperature reached by hay in the stack amounts commonly to 70° to 80° C.

It was found that heating could not take place in the absence of oxygen, but neither was steam-sterilised hay capable of spontaneous heating.

At the same time, a rise in temperature was obtained when a little ordinary hay was added to the sterilised, showing that the presence of micro-organisms is one of the factors necessary for the heating. Further evidence in support of a biological explanation as against a purely chemical one was afforded by the fact that hay moistened with formaldehyde or chloroform quite lost its self-heating capacity. The great absorption of oxygen by the hay at high temperatures and the production of carbon dioxide is taken as a proof of nothing more than that at high temperatures (after self-heating has been accomplished) oxidation takes place, leading to the stack catching fire, and the purely chemical nature of this latter phenomenon would seem to be doubted by no investigators.

Several different bacteria were isolated by Dr. Miehe, the most active of which was *B. calfactor*. This bacillus was found specially active between 40° C. and 70° or 75° C., above which temperature the heating is no longer due to biological conditions. A second bacillus (*B. coli*) was isolated, which caused a rise in temperature in *dead* hay from 18° C. to 42° C. It is not claimed by Dr. Miehe that heating between these temperatures is caused solely by this bacillus, as two other organisms were found able to cause heating, viz., *Oidium lactis* and *Aspergillus niger*, the former causing a rise to 58° C. and the latter to 43° C.

The writer's findings as to the causes of the heating of hay are summarised as follows:—

(1) Up to 40° C. (104° F.) heating is chiefly due to *B. coli*, or if the grass is not quite dead the first stage is caused mainly by respiratory activity.

(2) From 40° C. (104° F.) to 75° C. (167° F.) *B. calfactor* is mainly responsible.

(3) Above 75° C. (167° F.) the heating is purely chemical.

Necessary conditions to heating are the presence of moisture and a supply of oxygen. Bacilli can only develop in moist substances, and a water content of the hay of 25 per cent. was found sufficient to lead to considerable temperatures. The larger the stack, the higher will be the temperature of the interior.

Feeding Value of Varieties of Mangolds (*Univ. Coll., Reading, Dept. of Agric. and Hort., Bull.* xii.).—A comparison was made of Golden Tankard and Prizewinner Yellow Globe mangolds in regard to the total dry matter per acre produced. Both varieties were grown on four farms, and twenty-five average sized roots from each plot were analysed. The percentage of dry matter in Golden Tankards varied at the different centres from 12·75 to 14·15, and in Prizewinner Yellow Globes from 9·90 to 12·40. Thus six tons of Golden Tankard had approximately the same amount of dry matter as seven tons of Prizewinner Yellow

Globe. The weight of crop produced was, however, higher in the case of the Yellow Globe, so that in total dry matter produced per acre Golden Tankard had only a slight advantage. The percentage of sugar in the roots was also found.

WEEDS AND PLANT PESTS.

Growth of Tobacco for Nicotine Extraction (*Wye Jour., No. 19, 1910*).—Within the last few years the value of nicotine as an insecticide has become fully appreciated by growers of fruit and hops, with the result that the price is now almost prohibitive. The experiments described by Mr. Garrad were designed to test the possibility of growing tobacco and extracting nicotine from it in this country. An account of the results obtained in 1910 appeared in this *Journal*, August, 1911, p. 378.

Charlock Spraying (*Univ. Coll. of N. Wales, Bangor, Agric. Dept., Bull.* 1, 1910).—Demonstrations in 1910 were carried out at fourteen centres with solutions of 15, 20 and 25 lb. of copper sulphate in 50 gallons of water, forming 3, 4 and 5 per cent. solutions. These charlock spraying demonstrations are now concluded, having been conducted at about one hundred different centres in various parts of North Wales. They have shown that in the moist climate of the district 4 and 5 per cent. solutions of sulphate of copper, applied at the rate of 50 gallons per acre, practically destroy all the charlock. The 3 per cent. solution has only proved effective when the conditions have been particularly favourable.

A Bacterial Disease of the Potato Plant in Ireland (*G. H. Pethybridge and P. A. Murphy, Proc. Roy. Irish Acad., Vol. 29, Sec. B., No. 1, February*, 1911).—This paper contains a complete account of the investigation of the disease called Black Stalk-rot, carried out for the Irish Dept. of Agric. by the authors. A shorter report on the work was published in the *Jour. of the Dept. of Agric. and Tech. Instr. for Ireland*, and was summarised in this *Journal*, August, 1911, p. 420.

Observations on Parasitic Fungi causing "Fairy Rings" (*Jour. Econ. Biol., Vol. 6, No. 4, Oct.*, 1911).—The well-known "Fairy Rings" in grass land may be caused by several different fungi. In this paper Dr. J. S. Bayliss records observations made on the growth of rings formed by *Marasmius oreades*, Fr., and *Clitocybe gigantea*, Sow. Three distinct zones in the ring itself are distinguished, in addition to the disc of poor grass inside the ring—(1) an outer ring of dark green grass; (2) a zone of dead grass; and (3) an inner ring of dark green grass. The outer zone is usually overlooked, perhaps because it is, at the beginning of summer, only an inch or so in width, and by the time it has attained its full width of several inches, the grass of the field generally has deepened in colour, and the contrast is not so marked. The soil under all these three zones was found to be well penetrated with the mycelium of the fungus to a depth of about a foot, though it was most abundant under the ring of dead grass, and it is in this part of the "fairy ring" that the sporophores ("toadstools") appear when conditions are favourable. The soil in the centre of the ring showed no trace of fungus mycelium. Practically all the common pasture grasses, clovers, and weeds were killed by the fungi, though docks and sorrels seemed able to resist the attacks. The ring is constantly growing outward, and what is the outer zone of one year

is the dead zone of the next, and in the following year the dark green inner zone. Measurements of the rates of growth of a few "fairy rings" are given.

Experiments dealing with the question from various points of view were carried on in both the field and the laboratory, and the conclusions arrived at may be summarised as follows:—

The fungi investigated are parasites on grass and pasture plants. They attack the young roots, kill them by means of some toxic secretion, and gradually destroy the whole plant except the steles. The fungi bring about rapid decomposition of humus in the soil, so that the first effect on the grass is a stimulating one, and there can be distinguished a zone of dark green grass outside the dead grass zone, as well as one inside that ring.

Infected soil is very impervious to moisture. This is particularly seen in the dead grass zone, which can only with great difficulty be wetted. This was found to be due to air entangled within the meshes of the mycelium. The fungi secrete some substance toxic to themselves, and are not able to grow on the same soil three years in succession; during the second year the fungus dies off and the grass, gaining the upper hand, flourishes, owing to the increased amount of available nitrogenous food; hence the well-marked ring of dark green luxuriant grass inside the dead-grass zone.

It is suggested that the explanation of the well-known fact that "fairy rings" appear only on poor grass land is that on better land the grass is more vigorous and better able to resist the attacks of the fungus. Attempts to start "fairy rings" on lawns or in fields, either by using sods taken from existing rings or by sowing spores of the fungus, were quite unsuccessful.

A previous note on "Fairy Rings and their Eradication" appeared in this *Journal*, December, 1907, p. 537.

Leaf Spot of Celery (*Jour. Roy. Hort. Soc., October,* 1911).—Mr. F. J. Chittenden describes a destructive parasitic fungus (*Septoria petroselini,* var. *apii* B. and C.) which in 1909 and 1910 attacked celery to a serious extent in many parts of England. Usually the first symptom of the disease is the appearance of small pale spots on the leaves. These are quite unlike the burrows made by the celery fly larva (see Leaflet 35), and on examination with a lens, small, black dots can be seen on them. When the attack is severe, the whole leaf becomes almost olive-green, and soon the foliage wilts and the leaf stalk, which is also attacked, decays. Even when the attack is not sufficiently severe to cause decay, the growth of the plant is interfered with, and the crop diminished. The same fungus also attacks parsley.

Investigation showed that a great many samples of celery seed had the spores of the fungus upon them, and it is suggested that one of the principal ways in which the disease is spread is the use of such seed taken from an affected crop. Where disease makes its appearance the affected plants should be removed and burned, and the remainder sprayed with either freshly-made Bordeaux mixture or with a solution of potassium sulphide (1 oz. to 3 gallons of water) repeating the spraying after an interval of about a fortnight or three weeks, and again if necessary. Where disease has existed in a previous year it would be well to commence spraying early in the season as a safeguard.

Narcissus Fly (*Jour. Roy. Hort. Soc., October,* 1911).—The Narcissus Fly, *Merodon equestris,* Fab., was scheduled in 1910 by the Board under the Destructive Insects and Pests Acts. It has generally been supposed to confine its attacks to the bulbs of narcissus. Mr. F. J. Chittenden, however, reports that in November, 1910, bulbs of Atamasco Lilies (*Habranthus pratensis*), and Scarborough Lilies (*Vallota purpurea*), were sent to the Wisley Laboratory containing grubs which were later proved to be those of the Narcissus Fly. Cases of the fly attacking the bulbs of Lilies and Barbados Lilies (*Hippeastrum*) are also mentioned, and it is concluded that the Narcissus Fly will attack and destroy the bulbs of other plants than the daffodil, and any effort designed for its extermination should take this possibility into consideration.

LIVE STOCK AND FEEDING STUFFS.

Soy Bean Cake for Bullock Fattening (*Edinburgh and E. of Scotland Coll. of Agric., Rept.* xxv.).—These experiments were a continuation of those carried out by the college in 1909–10 with the object of comparing soy bean cake with linseed cake as a supplementary feeding stuff in fattening bullocks. The other food given varied slightly; at the first centre it consisted of 100 lb. turnips, 8 lb. straw, and 4 lb. Bombay cotton cake daily, and at the second, of 100 lb. swedes, 7 lb. oat straw, 2 lb. dried grains, and 3 lb. Bombay cotton cake. At the latter 8 lb. of hay was substituted for the straw in the last month. In both cases either linseed cake or soy bean cake was given at the rate of 2 lb. per day at first, increasing to 5 lb. during the last seven weeks. In the two years together 36 cattle were fed on each food, and the trials show that soy bean cake used as a supplementary feeding-stuff to the extent of 4 or 5 lb. per head daily, is a healthy cattle food, and a satisfactory beef producer. Weight for weight it is not equal to linseed cake, but when its lower price is taken into consideration, it has the advantage.

Pig Feeding Experiments (*West of Scotland Coll. of Agric., Bull. No.* 57).—During the years 1905–10 a series of seven experiments was carried out at the Dairy School, Kilmarnock. The object was to discover how best to utilise separated milk and whey in pig feeding, and what meals or mixtures of meals might be profitably used to replace or supplement the liquid food.

Five experiments were conducted between 1905 and 1908 with lots of young pigs. The number in each lot was eight in 1905 and four or five in succeeding years. All the lots were kept under the same general conditions. The pigs received practically an *ad lib.* quantity of food, though careful record was kept of the quantities actually consumed. The meals were not cooked or scalded, but were soaked for about twelve hours in cold water. Except in one case, where the effect of cold foods was tested, the food was given warm. In 1905 the foods used were:—(1) Separated milk and barley meal; (2) whey and barley meal; (3) water, barley meal, and a little bran; (4) whey and maize meal; (5) whey and Paisley meal (the latter a local by-product of maize, rich in albuminoids and oil); (6) whey alone. These were repeated in two experiments in 1906, with the addition of whey and Paisley meal fed cold. In 1907–8, in addition, one lot was fed on whey and

on whey and a mixture of barley meal and maize meal during the second twenty-eight days, and on whey and maize meal during the remainder of the experiment. In another lot this order was reversed.

It was found that whey was profitably utilised when fed alone to pigs, though the return was not nearly so great as when it was partly replaced by some of the meals. Taking an average of the whole experiments, it was found that pigs fed on whey alone increased in live weight at the rate of 1 lb. per day, and gave a return of ½d. per gallon for the whey and a further sum of 8s. 7d. per pig towards other expenses.

On the whole, when meal was fed in addition to the whey there was a greater and more rapid increase in live weight. Of the meals given with whey, maize meal produced over the whole experiments the greatest average increase, and pigs fed on it gave the best returns for the meal and whey consumed. It likewise gave a better return than the changing of meals during the feeding period. The proportion of maize meal to whey which gave the best return was 2 lb. meal to 2½ gallons whey on an average, with a smaller quantity of meal earlier, and a larger quantity later, in the feeding period. Whey and Paisley meal proved more profitable than whey and barley meal; in fact, the latter food failed to show a better return than whey alone.

The results obtained from a comparison of separated milk and barley meal with whey and barley meal showed that the relative values of separated milk and whey for bacon production were as 3 to 2.

The single test on the question showed that to produce the same increase 12½ per cent. less dry matter was required with warm food than with cold.

The amount of dry matter in the food required to produce 1 lb. increase in live weight varied with the kind of food, the live weight of the pig, and other conditions. In general, most was required when whey was fed alone, and least when maize meal and whey were fed in the proportion of 2 lb. to 2½ gallons. The bacon-producing values of separated milk, whey, and meals respectively were found to be increased when the liquid and solid foods were combined.

The quantity of food required to produce an increase of 1 lb. live weight grew in proportion to the weight of the pig. At 214 lb. it required 50 per cent. more food for the same increase than at 118 lb., and 19 per cent. more than the average amount required by animals of 118 to 214 lb. live weight. The live weight of the pigs increased from 100 to 210 lb. in nine or ten weeks (an average rate of 1·72 lb. per head per day) when fed on separated milk and barley meal. When the ration was maize meal and whey it required eleven weeks to produce the same increase (an average rate of 1·49 lb. per day).

Pigs fed on whey and maize meal gave the highest percentage of carcass weight to liveweight, and of bacon to carcass weight.

Barley meal without skim milk or whey produced a bacon inferior in quality to that from meals given with milk or whey. Barley meal and separated milk gave in every case the best quality of bacon. When whey was used in such quantity as to provide a considerable proportion of the dry matter of the food a good quality of bacon was obtained with all the meals.

In 1909 and 1910 tests were made with (1) whey and a mixture of equal parts barley meal and maize meal; (2) same as (1) with addition of cooked potatoes; (3) same as (1) with addition of uncooked potatoes; (4) whey and a mixture of two parts barley meal to one part rice meal; (5) whey and a mixture of equal parts barley meal and Paisley meal.

On the average of these two last experiments whey, with a mixture of equal parts barley and maize meal, gave the best results, both as regards live weight increase and the balance remaining after paying for food consumed; while the barley meal and Paisley meal mixture proved better than the barley meal and rice meal. Neither Lot 2 nor Lot 3 gave any return for the potatoes supplied.

Pork Production with Forage Crops (*Univ. of Missouri, Agric. Expt. Sta., Bull.* 95).—This bulletin gives the results of experiments carried out with the object of determining what forage crops are the most suitable and economical for feeding pigs. In an introduction to the report it is stated that with increased prices of grain and feeding stuffs of all kinds, the greater use of cheap forage crops must be looked to, to reduce the cost of producing pork. The forage crops tried included maize and rye, lucerne, peas, soy beans, red clover, blue grass, rape and oats.

The general plan of the experiment was as follows:—The hogs used were of early spring farrow, weighing at the commencement about 50 to 70 lb., live weight. Each forage was supplemented with grain, in quantities sufficient to produce a standard and equal rate of gain, the object aimed at being to have the animals from 125 lb. to 150 lb. live weight, at the end of the experiment. The experiments were carried out in the three summers 1908, 1909, and 1910, with the following results:—

Lucerne gave better returns than any other forage. The best system of using it appeared to be to supplement it with 2 lb. of maize per day for every 100 lb. live weight of the animal. In 1910 the total gain per acre in live weight of pigs pastured on lucerne was 1,310 lb., though, in addition to the lucerne, 4,022 lb. of maize was fed.

Red clover ranked next to lucerne as a forage plant for pigs. It did not feed so many per acre and also had a shorter forage season, but it fitted better into the rotation systems. In 1910, the only year in which it could be compared with lucerne, red clover produced an increase in live weight of 1,050 lb. per acre, though, in addition to the pasture, the pigs received 2,872 lb. of maize.

The bulletin suggests that the following is the best system of using the clover:—While the clover is growing rapidly about a pound a head of grain per day should be given; when in bloom (and it should not be pastured so closely but that it will bloom) little or no supplementary food need be given, as pigs are fond of clover heads, and will make satisfactory gain without grain. At other times from 3 to 5 lb. of grain per head per day may be given.

Rape did not give such good returns as clover and lucerne. The best results were obtained when it was sown along with oats and red clover, the latter being left to stand over till the following year.

It was found difficult sometimes to get the pigs to eat rape when first turned on to it.

Sorghum, peas, soy beans, rye, and maize were also tried as forage crops, but the results were not so good as with clover and lucerne.

The following conclusions are drawn from the experiments :—

1. The use of forage crops in the production of pork is more economical than full feeding on heavy grain rations.

2. Gains made on forage are made at 20 to 30 per cent. less cost than gains produced by grain feeding alone.

3. In 1910 the increase in live weight produced per acre by lucerne (after deducting the increase due to the grain fed) was 596 lb.

4. Red clover ranked among the first as a hog forage, because of the palatability of the feed throughout the season, and also because of its adaptability to rotations. In 1910 the average increase in live weight per acre (after deducting the increase due to the grain fed) was 572 lb.

FORESTRY.

Method of Planting Forest Trees (*Roy. Agric. Coll., Cirencester, Scientific Bull., No.* 2, 1910).—An experiment was made to ascertain whether the results obtained at the Woburn Experimental Fruit Farm in the planting of fruit trees would be borne out in the case of forest trees. The land used was old pasture, with a deep and somewhat heavy soil. Twenty four-year-old trees were planted of each of the following kinds: oak, ash, beech, spruce, Corsican pine, and Scots pine, and the planting was carried out as follows:—Ten trees of each kind were planted in pits, every care being taken to give the roots enough room; the finer soil was placed round the roots, and the whole carefully and firmly trodden down. The other ten trees were planted in very shallow pits, into which the roots were merely pushed anyhow, the soil placed on the top in thin layers, and well rammed with a heavy iron rammer. No care was taken not to injure the roots. The trees were lifted and weighed after two years, but the number was too small to give reliable averages. It is noted, however, that no more of the rammed and carelessly planted trees died than of the others, and in general appearance the two sets could not be distinguished. An examination of the roots confirmed Mr. Pickering's former conclusions that great care in digging holes and carefully spreading out the roots is not of much importance, as in many cases the old roots do not throw out new roots to any extent, while it is important to see that trees are put quite firm in the ground, although ramming would be too expensive for ordinary planting.

HORTICULTURE.

Fruit Bud Formation (*New Hampshire Agric. Expt. Sta., Bull. No.* 153).—Investigations were begun in 1908 into the effects of certain methods of cultivation, manuring, and cropping of the soil on the formation of fruit buds on apple trees. An orchard consisting of over 200 trees, nearly all Baldwins, and about twenty-five years old, was chosen, and divided up into eleven plots. It would be inadvisable to draw definite conclusions from an experiment extending over such a short time, but reviewing the results up to 1910, it is clear that

cultivation was the most influential factor affecting the production of fruit buds and of fruit. It is concluded that this was effective owing to its conserving the moisture in the soil. The next most important influence appeared to be the supply of nitrogen by means of a leguminous crop grown as a green manure.

Treatment of Old Orchards (*Trans. Mass. Horticultural Soc.*, 1911, *Pt.* 1).—Some suggestions for the renovation of old orchards are given in this publication which may be compared with the treatment advocated in Leaflet 70.

It is recommended that all dead or worthless trees should in the first place be removed and burnt, as they harbour insect and fungus pests. The ground about the trees should be kept clear of waste material. Two or three years must of necessity elapse before the old trees can be properly pruned, on account of their low vitality. The dead wood and growths of shoots, suckers, &c., must be removed, and at the first treatment the tree should be pruned slightly to open the top. If the desired top is obtained in three years the result should be considered satisfactory. The physical condition of the tree being dependent upon the leaves, the growth of the latter should be stimulated by a heavy dressing of nitrogenous manures, *e.g.*, 10 lb. per tree of the following dressing applied early in May before the appearance of the leaves:—700 lb. nitrate of soda, 300 lb. sulphate of ammonia, 460 lb. sulphate of potash, 440 lb. superphosphate, and 100 lb. kainit.

Trunks and large branches should be thoroughly scraped to remove eggs, &c., under the bark, care being taken not to injure the new wood. Trunks and branches should also be scrubbed at the beginning of April with a lime and caustic potash wash.

By the time the tree is pruned it approaches its normal condition, and more radical steps can be taken to protect it from pests and diseases. Lasting injury is almost certain to result from attempts to spray before the tree reaches its normal condition.

Subsequent manuring is largely a matter for individual experiment, but 15 lb. per tree annually of the following dressing is suggested:—300 lb. nitrate of soda, 300 lb. bone meal, 1,000 lb. basic slag, and 400 lb. sulphate of potash. Grafts should be made from varieties with high reproductive power.

OFFICIAL NOTICES AND CIRCULARS.

Report on Grants for Agricultural Education and Research, 1910-11.

The Report of the Board of Agriculture and Fisheries on the Distribution of Grants for Agricultural Education and Research in 1910–11 has recently been issued [Cd. 6025, price 3*d.*] During 1909 the Treasury sanctioned a considerable increase in the Board's Estimates in respect of these grants, and the amount distributed in aid of educational institutions increased from £12,300 in 1909–10 to £18,840 in 1910–11. Most of the Institutions which usually participate in these grants accordingly received aid on a higher scale than heretofore. In addition to these amounts, which are primarily for the promotion of agricultural educa-

tion, a sum of £425 was allotted in the course of the year in the form of special grants for experiments and research.

Acreage and Live-Stock Returns.

The Board have recently issued Part I. of the Agricultural Statistics for 1911 [Cd. 6021, price 5½d.], containing the returns of the acreage of crops and number of live stock in Great Britain as collected in June, 1911, together with summaries for the United Kingdom. A preliminary statement containing the totals for Great Britain was issued on September 26th.

Report of the Intelligence Division, 1910-11.

Part II. of the Report of the Intelligence Division of the Board, on the proceedings under the Destructive Insects and Pests Acts, 1877 and 1907, and the Board of Agriculture Act, 1889, for the year 1910–11 has been published [Cd. 6020, price 2s. 1d.], and gives an account of the work accomplished by the Division between April 1st, 1910, and March 31st, 1911, especially in regard to the measures for combating American Gooseberry Mildew and Wart Disease of potatoes, and to investigations on the Large Larch Sawfly and the Isle of Wight Bee Disease. Maps are given in the Report showing the number of cases and the amount of American Gooseberry Mildew, the distribution of the Large Larch Sawfly, and the intensity of Wart Disease in 1910–11.

Issue of Certificates Required in Connection with the Exportation of Plants.

With a view to assist nurserymen in Great Britain to develop their export trade, the Board of Agriculture and Fisheries are prepared to issue the certificates required by the Governments of the countries and colonies to which plants are to be exported under the following conditions.

1. In cases in which consignments of plants or bulbs are only admitted on production of a certificate by the Board, or by one of their Inspectors, that the contents have been examined and declared to be healthy or free from certain specified pests, application should be made to the Board a few days before the consignment is to be dispatched. When the parcel does not weigh more than 7 lb., and it is to be sent by parcel post, the plants should be sent ready packed in a box, with the lid not nailed down, to The Secretary, Board of Agriculture and Fisheries, 4, Whitehall Place, London, S.W., marked on the outside "Plants (or bulbs) for export." If it is desired that the parcel should be dispatched by the Board, after the certificate has been signed, a prepaid adhesive label addressed to the consignee should be enclosed, and the Customs declaration form required by the Postal Regulations (Post Office Guide, p. 772) should be filled up and affixed to the box.

The necessary fee must also be enclosed if it is desired that the parcel should be insured, but it must be understood that the Board cannot, in any case, accept any responsibility for any loss or damage which may arise.

No charge is made for the Board's certificate unless the parcel is

over 7 lb. in weight or the Inspector is required for any reason to travel to the place where the consignment is to be examined. In this case a charge of £2 2*s.* will be made, which must be paid before the certificate can be issued.

2. In cases in which consignments of plants are only admitted on production of a certificate from the Board that the nursery in which they have been grown has been examined and found to be free from certain specified pests, application for the attendance of an Inspector must be made before May 1st each year, in order that the nursery may be examined from time to time during the summer. A fee of £2 2*s.* will be charged for the certificate, and the remittance must be sent to the Board not less than a month before the beginning of the shipping season.

3. In cases in which a certificate of the Board is required stating that no disease of a certain kind has been reported from the neighbourhood in which the plants were grown a declaration signed (and in some cases sworn) by the grower must be sent, stating that the plants (in most cases potatoes) were grown on a particular farm, and naming the parish and county in which such premises are situate, together with a declaration that the disease in respect of which the certificate is issued has not occurred on those premises.

The application should be received by the Board not less than three days before the consignment is to be dispatched. No charge is made for this certificate.

In cases in which the certificates required do not fall within any of the foregoing categories nurserymen who wish to export plants should apply to the Board for further particulars.

Importation of Live Stock into British West African Colonies.—The Board have received, through the Colonial Office, the following information relating to the importation of cattle into the British West African Colonies and Protectorates:—

Importation Regulations.

Northern Nigeria.—There are no laws in force for the prevention)f the introduction of contagious diseases.

Southern Nigeria.—The Prevention of Disease (Animals) Ordinance)f 1908 empowers the Governor in Council to make rules prohibiting he importation of animals, and such rules may provide for the stablishment and maintenance of quarantine stations for animals and or slaughtering diseased animals with or without compensation, or .nimals suspected of being diseased, with compensation.

There is, however, no regular examination of animals entering he Colony.

Gold Coast.—Ordinance No. 10 of 1876 empowers the Governor *o prohibit the importation of infected live stock.*

Sierra Leone.—There are no laws for the prevention of the introuction of contagious diseases of animals.

Gambia.—The Prevention of Disease (Animals) Ordinance of 1909 mpowers the Governor in Council to make rules similar to those nder the Ordinance of 1908 of Southern Nigeria.

Importation of Animals into German East Africa.—The *Deutsches Colonialblatt* of December 1st contains a decree of the Governoreneral of German East Africa, dated August 15th, 1911, prohibiting

the importation into German East Africa of cattle and other cloven-footed animals from European countries. (*Board of Trade Journal*, December 14th, 1911.)

Agricultural Exhibition Abroad.

International Agricultural Exhibition at the Hague in 1913.—A national and international agricultural exhibition will be held at the Hague in August, 1913, under the auspices of the Royal Netherland Agricultural Society. Two sections only of the exhibition will be open to international exhibits, viz., agricultural implements and agricultural buildings. The implements section will be divided into four classes—(1) for exhibits of Dutch and foreign manufactured implements and machinery; (2) for exhibits of implements and machinery made in rural districts; (3) for exhibits of new or improved implements; and (4) trials of implements. The section for agricultural buildings will be divided into two classes—(1) for building materials; (2) for actual buildings or models, drawings, and photographs. Full particulars as to the exhibition may be obtained from the Secretary of the Royal Netherland Agricultural Society, Buitenhof, 42, the Hague, Holland.

Miscellaneous Notes.

Action of the International Agricultural Institute with regard to Plant Diseases.—The International Institute of Agriculture drew attention in 1909 to the importance of disseminating information as to methods of combating plant diseases and to the desirability of effective control of plant diseases on the part of the various Governments adhering to the Institute. The adhering countries were also asked by the Institute to consider the possibility of establishing a service for the control of plant diseases or of developing their existing service.

A Bureau of Agricultural Intelligence and Plant Diseases has been formed at the Institute, and as a preliminary measure a monograph* has been published giving an account of the actual organisations existing in different countries for the control of plant diseases. The Bureau also commenced the publication in November, 1910, of a monthly bulletin containing summaries of articles in agricultural periodicals and in the publications of laboratories and experimental stations having reference to plant diseases.

The Institute recognised, however, that, in addition to this passive side of its work in connection with plant diseases, it had an active duty to perform by bringing about international arrangements whereby the combating of plant diseases could be more effectively carried on. Proposals were made at the General Assembly of the Institute in December, 1909, by which State-controlled experimental stations in the different countries should conduct research work according to a given plan. Advice was asked of experts in Italy, France, Germany, and the United Kingdom, and great divergence of opinion was found to exist as to the general utility of the proposal. It was therefore proposed at the last General Assembly of the Institute in May, 1911, that a programme of work as to plant diseases in which the co-operation of the different countries is desirable should be drawn up by an

* *Institut International d'Agriculture, Bureau des Renseignements Agricoles et des Maladies des Plantes.*—L'Organisation actuel du service de protection contre les maladies des plantes et les insectes nuisibles dans les divers pays (223 pp.). Rome, 1911.

international commission formed of members chosen by the adhering States. It was suggested in the first place that a report should be prepared drawing the attention of the different Governments to the necessity for the formation of an international commission of vegetable pathology. The committee further recommended that the General Assembly should ask the adhering Governments to invite their stations of vegetable pathology to communicate to the Institute without delay the results of their work and investigations, above all of those dealing with the efficacy of remedies for plant diseases, with a view to their publication in the monthly bulletin of the Institute.

Visitors to Kew Gardens during 1911.—The number of visitors to the Royal Botanic Gardens, Kew, during the year 1911 was 3,704,606. These figures represent an increase of 158,304 persons over the year 1910, when there were 3,546,302 visitors, and are the highest yet recorded.

The steady annual growth in the number of visitors during the past twenty years witnesses to the ever-increasing popularity of Kew Gardens.

Year.	Sundays.	Week-days.	Total.
1893-1902 (average)	—	–	1,352,425
1903	568,726	783,822	1,352,548
1904	675,225	904,441	1,579,666
1905	853,631	970,688	1,824,319
1906	867,148	1,472,344	2,339,492
1907	1,268,501	1,694,213	2,962,714
1908	1,321,384	1,388,836	2,710,220
1909	1,384,369	1,975,852	3,360,221
1910	1,614,085	1,932,217	3,546,302
1911	1,517,650	2,186,956	3,704,606

The month in which the largest number of persons visited the Gardens was July, when 737,946 visitors were recorded. There were 157,425 visitors on June 5th, 1911.

Inferiority of Wool owing to Presence of Coloured Hairs.—At the annual meeting of the British Association of Wool Buyers in 1911 a complaint was made that in recent years much wool had to be classed as of inferior quality owing to the presence in the wool of hairs other than white. It was stated that wool buyers had found that farmers had been crossing breeds so much that even in the most unlikely districts grey hairs were present in the wool, and that, in consequence, the wool was unsuitable for the more valuable yarns, and could not be purchased. It was often found, for example, that farmers in the north of England crossed their North or Cheviot ewes with an Oxford ram. Other causes of inferior quality referred to were the use of a dip that discoloured the wool, and the employment of tar for branding sheep.

World's Production and Consumption of Wool.—The following information regarding the production and consumption of wool is extracted from the report by the President of the French Permanent Customs Values Commission on the foreign trade of France in 1910:—

The number of sheep in Europe is steadily decreasing; the increase in the yield of wool per sheep has up to the present kept the output of

wool on the Continent almost constant, but this will soon cease to be the case, since the yield per sheep cannot increase much in the future. The North American flocks should increase in size, at any rate for some years to come. The Australian flocks, temporarily lessened by drought, have again begun to increase. The number of sheep in Australia and New Zealand increased from 110,480,000 in 1909 to 115,450,000 in 1910. The yield of wool per sheep has also increased considerably, thanks to judicious crossing, selection, and the infusion of merino blood. In the Argentine the flocks moved into colder regions bore the change of climate very well. The drought of 1909 destroyed many lambs and greatly reduced the output of wool in 1910, but there is stated to be an improvement this year (1911).

The world's *production* of wool in 1910 is estimated at 26,369,000 cwt. Making allowance for the quantities consumed by local industries in the countries of exportation, the supplies available for the manufacturers of Europe and North America were as follows:—

	cwt.
Production of—	
Continent of Europe	3,744,000
United Kingdom	1,275,000
North America	2,968,000
Exports from—	
Australasia	7,622,000
Argentine and Uruguay	3,86[illegible],000
South Africa	1,114,000
Other countries outside Europe	2,113,000
Total	22,696,000

The quantity available in 1909 amounted to 23,106,000 cwt. The supply for the manufacturing countries was thus about the same in 1910 as in the preceding year; the supply from Australasia increased by 7 per cent., and that from other exporting countries decreased.

The *consumption* of wool has grown very slowly in the last decade, increasing during the ten years 1901–10 by only 13 per cent. In 1910 there was an increase, as compared with 1909, in the consumption in Europe, and especially in the United Kingdom, and a considerable decline in that in North America. The consumption of raw wool during the year 1910 is estimated to be as follows (*Board of Trade Journal*, November 16th, 1911):—

Continent of Europe	*12,684,000*
United Kingdom	5,463,000
North America	4,546,000

Notes on Agriculture Abroad.

Cattle Breeding in Paraguay.—The following information with regard to cattle breeding in Paraguay is given in *F.O. Report* No. 4815 (Annual Series) on the trade of that country in 1910:—

Cattle breeding is the principal industry in Paraguay. Both the country and the climate are exceedingly favourable and the rate of reproduction is remarkably high. There is abundance of water, and the animals are not subject to serious diseases. A mild form of foot-and-mouth disease appears, however, to be common, and was prevalent throughout the country during 1910. Land suitable for cattle fetches from £600 to £2,000 per league (4,860 acres). The latter price would be for the best land well situated as regards communications by

rail or river. Land in the Chaco, a part of the country that is little known and almost entirely undeveloped, is cheaper. Some of the lands that are ordinarily suitable for cattle raising are liable to inundation. There is a good demand for cattle, both for local consumption and for the factories of preserved meat and meat extract. The average price of animals weighing 190 to 200 kilos (420 to 440 lb.) is about £3 in winter and £2 15*s*. in summer at the capital and less in the country districts, but prices vary greatly with local conditions. Ox-hides sell at about 4*d*. per lb. and cow-hides at 3*d*. per lb. According to the latest census, taken in 1902, the total number of animals in the country was 3,104,453, but the number is probably greater to-day. Horse breeding in Paraguay, on the other hand, does not thrive, owing chiefly to the prevalence of the *mal de cadeira*, a fatal disease which attacks horses and goats, and the cause of which is at present unknown.

Government Aid to Live Stock Breeding in Argentina.—A report by the United States Consul at Buenos Aires states that a Bill has passed the Argentine Chamber of Deputies granting a Government bounty to the first freezing works erected in the province of Entre Rios. The bounty is to be paid for five years, and will consist of about 8*s*. 6*d*. per head for cattle and about 1*s*. 8*d*. per head for sheep exported. The live stock industry in other provinces is considered to be on a satisfactory basis, and not in need of State protection. (*U.S. Daily Consular and Trade Reports*, November 17th, 1911.)

Cattle and Meat Industry in Argentina.—The British Acting-Consul at Buenos Aires (Mr. F. G. Rule) has forwarded copies of a pamphlet issued by the Argentine Agricultural Society, giving detailed information on Argentine stock-breeding, the export of live stock, and the frozen meat industry, and containing also an article on the local development of scientific agriculture. A few copies are available for distribution.

Pedigree Live Stock Imported into Argentina, 1901–1910.—The following particulars regarding the importation into Argentina of pedigree stock of various classes and breeds during the period 1901–1910 is given in "Argentina: its Agriculture and Live Stock in 1910" (*Anales de la Sociedad Rural Argentina*):—

Cattle.—Shorthorn, 8,661; Hereford, 339; Polled Angus, 370; Red Polled, 98; Jersey, 92; various, 124; total 9,684. The total value of these 9,684 animals was £1,268,646, or £131 per head.

Sheep.—Lincoln, 22,985; Merinos, 566; Hampshire, 1,441; Shropshire, 1,590; Romney Marsh, 1,139; various, 1,172; total, 28,893. The total value of these 28,893 animals was £378,511, or £13 2*s*. per head.

Horses.—Percheron, 1,003; Clydesdale, 696; Shire, 365; Hackney, 438; Yorkshire, 89; Suffolk, 56; Anglo-Norman, 75; Shetland, 71; Pony, 31; Arab, 17; various, 595; total, 3,436. The total value of these 3,436 animals was £450,131, or £131 per head.

Asses.—French, 105; Spanish, 835; Italian, 3; various, 17; total, 960. The total value of these 960 animals was £67,048, or £70 per head.

Pigs.—Yorkshire, 440; Berkshire, 1,795; various, 409; total, 2,644. The total value of these 2,644 animals was £23,092, or £8 14*s*. per head.

The total value of pedigree stock of all kinds imported in the ten years was £2,187,454.

Agriculture in Siberia.—An account of agriculture in Siberia is given in a report by H.M. Vice-Consul at Omsk (*F.O. Repts., Annual Series*, No. 4801).

Cereals.—The future of Siberia is considered to lie in the export of dairy produce rather than grain. Although, owing to the large immigration, more land is coming into cultivation yearly, and the production is increasing, the export of cereals does not increase in proportion, as the home demand also increases, some parts of Asiatic Russia consuming more than they produce. A result of the increased immigration is that the Russian peasant is no longer able to take up fresh land every year, and it now happens that the same crop is grown on the same land year after year, with moderate results if the summer is wet, but with poor results if the summer is dry. It seems to be the general opinion that the grain export will not have any very great future, because freight on the railway and cartage for long distances to the railway, prohibit the grain being sold otherwise than at a loss to the farmer, and, in consequence, he sells only in those years in which he has an excess. It is probable that, in the near future, all grain not required for home consumption or for seeding will be used for feeding cattle or pigs.

Butter.—The principal export from Siberia is butter. Most of the butter is exported through foreign firms, who have either their agents or their own branches in the butter-exporting districts. Several attempts at exporting have been made by syndicates of dairy associations, but these have not been able to compete successfully with private exporters. The quality of Siberian butter, according to reports, is improving, owing to more careful grading on the part of the exporters, and dairy owners are endeavouring to obtain good dairymen, in order to reap the benefit of the higher prices paid for butter of superior quality—the more so as the demand for second- and third-class qualities is greatly decreasing, not only from the United Kingdom and the Continental countries, but from European Russia also.

The exports of butter are chiefly to the United Kingdom and Germany, these countries having taken nearly one-half and one-third respectively of the total exports, both in 1909 and 1910. The demand from European Russia and the Far East is steadily increasing, however.

Live Stock.—Cattle in Siberia are principally bred for dairy purposes, but on the Steppes the Kirghese breed cattle for food. This business has very little interest for people abroad, as practically all cattle slaughtered are for local consumption.

The export of pigs is increasing, and it is believed that the figures for 1910 would be about 50,000 pigs.

The quality is not first class, a fair proportion being apparently good secondary, the rest poor; but the high prices for bacon which existed in the United Kingdom during 1910 have been a great help to a young industry. However, with lower prices abroad and a crop failure in Siberia during 1911, the business will be thrown back for a time.

Undoubtedly when the breed of pigs improves, as it will do in Siberia, in the same way as in other countries, and with normal prices, there will be a great export, and people interested in the

business would do well to keep their eyes upon it, as in the future bacon will probably be the second most important export from Siberia, and the United Kingdom will certainly be the chief market.

Agricultural Machinery in Poland.—The following particulars are taken from a report by H.M. Consul at Warsaw:—

In Poland the sale of agricultural machinery is extensive, and promises to increase yearly as the cost of manual labour is enhanced. The cutting up of large estates into small holdings increases the number of cultivating units, and both the Government and agricultural societies are trying to encourage the small farmers and peasants to buy machinery and implements, in order to improve the system of cultivation. Important results have already been obtained in this direction.

In 1910, for the first time, steam ploughs were introduced into Poland. Two were brought from the United Kingdom and some from Austria-Hungary, but their future success is a matter of divided opinion, many holding that the majority of the Polish estates are too small, and that farm labour is not dear enough yet to warrant the heavy expenses connected with the purchase and working of these machines.

The local manufacture of implements and machines is slowly but steadily developing, despite the present tariff facilities offered for the importation of foreign goods in this line.

Demand for Fertilisers in Poland.—The following information is from the report by H.M. Consul at Warsaw (Mr. C. Clive Bayley) on the trade of Poland and Grodno in 1910:—

The use of fertilisers is becoming much more general in Poland, not only on large estates, but also among farmers, and in some districts among the peasants. The various agricultural societies and peasant associations afford their members facilities for purchasing fertilisers, in order to encourage their use, and the efforts of these associations are meeting with great success. In order to increase the output of cereals on peasant lands the Russian Government is proposing measures such as the granting of subsidies to agricultural societies, and the sale of fertilisers to the peasants on long terms of credit. The fertilisers most used at present are superphosphates, basic slag, nitrate of soda, sulphate of ammonia, and potassium salts.

The price of superphosphates, quoted by the Artificial Manure Syndicate, per 1 per cent. of soluble phosphoric acid in 100 lb., delivered free at any railway station in Poland, was 2·28*d.* in the spring of 1910, and 2·34*d.* in the autumn. As the output of the local works is insufficient to meet the demand, large quantities are imported, chiefly from Silesia and Posen. The manufacturers in those districts have adapted themselves to the Polish demands as regards quality, and, being always ready to grant four to six months' credit, can compete successfully with Polish works. The only real condition disadvantageous to British firms competing with the local and German firms is the question of greater freight charges. Unless, however, British firms are prepared to extend a similar amount of credit it is not the least use trying to enter the Polish market.

Basic slag is imported from Germany and Belgium; the prices paid during the year were 1·90*d.* to 1·96*d.* per 1 per cent. of phosphoric acid soluble in citric acid in 100 lb., delivered free at any station in Poland.

Nearly all the Belgian slag was imported *via* Dantzig, and competed successfully against the German product. Here again, adds the Consul, is an excellent opening for British exporters, provided they will give four to six months' credit, and can supply high-graded slag containing at least 17 per cent. of phosphoric acid soluble in citric acid.

Demand for Agricultural Machinery in Bulgaria.—H.M. Vice-Consul at Sofia, in reporting on the trade of Bulgaria in 1910, states that machinery ploughs are supplied in Bulgaria on easy terms by the Agricultural Bank and its provincial agencies. In the case of larger machinery, farmers co-operate to purchase threshers and reapers, &c., which are provided by the bank for 40 per cent. cash, the machines themselves being the security for the remaining 60 per cent. The agricultural society and the Magasin National of Sofia provide machinery on similar terms, most of it being ordered in Austria-Hungary and Germany.

According to statistics published in 1909, there were at work throughout the country 398,000 native and 84,000 modern ploughs, 761 drills, 4,156 reapers, 611 threshers, and 73,700 other agricultural machines.

Possibility of an Export of Guano from Assumption Island, Seychelles.—The possibility of an export of guano from Assumption Island, Seychelles, is discussed in a report recently prepared by the curator of the Botanic Station in the Seychelles.

The guano, it appears, occurs on the island in two forms, viz., as a shallow formation over the surface, and in pits which have become gradually filled with guano as a result of the washing action of rain water. The amount of surface guano available is estimated at 270,000 tons, and of pit guano about 106,000 tons. The latter is stated to be of the best quality, much richer, in fact, than the surface guano, since the action of percolating water in the pits removes much of the organic matter and increases the proportion of phosphate of lime. (*Bulletin of the Imperial Institute,* Vol. IX., No. 1, 1911.)

Agricultural Machinery in Smyrna.—A memorandum on the increase in the use of agricultural machinery in the province of Smyrna, Turkey, has been received from H.M. Vice-Consul at Smyrna (Mr. Heathcote Smith), in which it is stated that a demonstration train was run through the province for nearly 40 days in the autumn of 1909, carrying specimens of agricultural machines, which were exhibited and submitted to practical trials at all the principal agricultural centres.

Great interest was aroused by comparative tests between the local wooden plough and European ploughs. The representatives for the English machines arranged for a dynamometer to be fixed on to the different ploughs when working, and, its reading being very simple, the peasants were able to follow the demonstration with ease. The increased use of ploughs is seen from the figures relating to imports into the province; these were, in 1908, 1,649, valued at £1,773; in 1909, 5,113, valued at £6,013; in 1910, 4,728, valued at £4,386; and in 1911 (eleven months only), 8,756, valued at £8,045. The imports of harrows, reapers, reaper-binders, mowers, threshers, traction engines, vine sprayers, and machine parts is also increasing.

Notes on the Weather in January.

The weather in the *first* week of the new year (December 31st to January 6th) was very dull generally, with occasional rain in all districts. Snow and sleet were experienced in the North Midlands and the north and north-east of Britain generally on the 6th. Heavy rainfall was experienced all over the country, except in the east and west of Scotland; warmth was everywhere "unusual," the excess of temperature above the average being more than 6° in several English districts. Bright sunshine was generally less than the normal.

During the *second* week a generally unsettled condition prevailed, with much snow and sleet early in the period in the more northern districts, and occasional rain subsequently. In the east and south of England rain was less frequent than elsewhere. Temperature was lower than during preceding weeks, but was again above the average except in England N.E. Bright sunshine was below the normal in the eastern districts, but was above it over England N.W. and Scotland W. and N.

The weather continued unsettled throughout the *third* week, with heavy falls of rain, sleet, or snow during the earlier half of the period, and of rain in many places during the later days. Nearly every part of Great Britain experienced snow, but in the south-east and south of England it was very slight. Warmth was everywhere "moderate," and sunshine "scanty," or "very scanty." No sunshine was recorded during the week in the east of England.

During the greater part of the *fourth* week the conditions continued very unsettled over all the southern, eastern, and south-western parts of England, with much cloud and frequent falls of rain, while slight precipitation also occurred in the east of Scotland. Late in the week a marked improvement took place over the whole country. Much mist and fog was experienced from time to time in England. Over the whole week temperature was below the average, while the amount of rainfall and bright sunshine recorded varied greatly in different districts.

Agricultural Conditions in Great Britain on February 1st.

The Crop Reporters of the Board, in reporting on agricultural conditions on February 1st, refer to the very wet weather prevailing throughout the country during the first three weeks of January, and state that the autumn-sown crops all looked healthy and vigorous, with the exception of a few pieces on heavy or low-lying lands, where the plant was sometimes thin or weak. The sharp frosts (which were accompanied by heavy snow in the midlands and north) during the last week of the month were generally welcomed, and allowed arrears of farm work, such as carting manure, to be performed.

Lambing in the south of England has not progressed very favourably. Reports as to the fall of lambs are rather variable, some putting it as about average, and others as rather less. But there seems to be very generally a rather heavy mortality among the lambs or the ewes —particularly among ewes in Somerset and Dorset. Complaints are also numerous that the ewes are in poor condition—owing partly to the wet and partly to the shortness of roots; that they are not giving

normal quantities of milk; or that the lambs are weak or difficult to rear. Where lambing has not begun, ewes—owing largely to scarcity of suitable food—are mostly in poor condition, and a certain amount of apprehension is consequently felt as to the prospects. In Scotland, ewes have generally come through the winter fairly well, although there are some exceptions, and the position there is better than in the south.

Stock can be said to have wintered only fairly well. Cattle are generally healthy, but often in rather poor condition and backward. Sheep are less satisfactory, and heavy mortality is reported from some districts. The very open winter has, until recently, allowed of stock being out more than usual, and the scanty stores of roots, hay, and straw have thereby been economised. But these supplies, as well as artificial foods, had to be drawn upon when the frosts came, and it is feared that there may be much scarcity should the spring prove late. In some cases the shortness of keep is reported to have led to a certain number of cattle being marketed in an unfinished condition.

Notes on Crop Prospects Abroad.

The *Bulletin of Agricultural Statistics* for January, 1912, issued by the International Institute of Agriculture, gives the final returns of the production of the cereal crops last year in Norway, Sweden, and Canada. Estimates are also given of the acreage sown with winter cereals in several countries of the northern hemisphere.

Norway.—The total production of each of the four cereal crops—wheat, barley, oats, and rye—in 1911 was less than that of the previous year; the wheat crop of 34,000 qr. was 14 per cent. less; barley, 322,000 qr., 10 per cent. less; oats, 1,045,000 qr., 15 per cent. less; and rye, 110,000 qr., 11 per cent. less than in 1910.

Sweden.—The production of wheat in 1911 was 1,029,000 qr., 9½ per cent. more than in 1910, but that of barley and oats was 5½ and 14 per cent. respectively less than in 1910, the production of barley being 1,763,000 qr., and oats 7,789,000 qr. in 1911. Rye was returned at 2,879,000 qr., being very slightly greater than in 1910.

Canada.—The final harvest returns showed a marked increase in the case of wheat as compared with the preliminary returns, the production being 26,974,000 qr., or 1,607,000 qr. more than previously estimated. The production in 1911 was 44 per cent. greater than that of 1910 in the case of wheat, but that of barley, 4,875,000 qr., was 10 per cent. less. Oats were 7½ per cent. more than in 1910, being returned at 37,933,000 qr., whilst maize, which was returned at 2,190,000 qr., showed very little change from the previous year.

New Zealand.—The area placed under wheat in 1911 was 216,000 acres, under barley 32,000 acres, and under oats 404,000 acres. The acreage of oats increased 34 per cent. as compared with 1910, but that of wheat and barley decreased 33 and 4 per cent. respectively.

Planting of Winter Cereals.—The areas estimated to have been sown to *wheat* up to December 31st, 1911, compared with the areas sown during the corresponding period of 1910, expressed as percentages, are as follows:—Belgium, 104; Denmark, 100; Spain, 95; France, 112; Great Britain, 106; Luxemburg, 102; Switzerland, 100; Canada, 97; United States, 99; and India, 99. (The figures for India

refer to about 89 per cent. of the total reported wheat area of India.) The *areas* sown to *rye* are, for Belgium, Denmark, and Switzerland, 100; Spain, 90; France, 96; Luxemburg, 102; and United States, 101. The areas sown to *barley* are:—Belgium, 107; Spain, 90; France, 114; Luxemburg, 112; and Switzerland, 100; and to *oats*, Spain, 105; France, 107.

The weather during the sowing season was generally favourable; germination was uniform, and a good plant was obtained. The wet and mild weather during December provoked too rapid a growth in France, and weeds were becoming troublesome, whilst in Ireland some resowing may be necessary on account of flooding in some low-lying areas.

Bulletin of Agricultural Statistics, Supplement, January, 1912.—The production of wheat in *Argentina* in 1911–12 is estimated to be 21,315,000 qr., as against 17,035,000 qr. in 1910–11, or an excess of 25·1 per cent. The production of oats is estimated to be 6,238,000 qr., as compared with 3,741,000 qr. last year, or an increase of 66·7 per cent. The production of maize is estimated at 32,142,000 qr., as against 3,214,000 qr. last year, when a large part of the area had to be abandoned.

New Zealand.—The production of wheat in 1911–12 is estimated to be 811,000 qr., as compared with 1,034,000 qr. in 1910–11, or a decrease of 21·6 per cent.; and the production of oats, 1,917,000 qr., as against 1,261,000 qr. in 1910–11, an increase of 52 per cent.

The total production of wheat in Argentina, Chili, Australia, and New Zealand is estimated to be 36,363,000 qr. in 1911–12, as compared with 34,467,000 qr. in 1910–11, or an increase of 5·5 per cent.

Russia.—H.M. Ambassador at St. Petersburg transmits a report on the condition of the young crops in December, 1911. The information refers to 78 of the 91 governments of the Empire, and comprises European Russia, Poland, the Caucasus, Western Siberia, the Steppes, and Turkestan. In the remaining governments practically no crops have yet been sown, or the information was too scanty for use. The condition of the young crops was "entirely favourable." In the great majority of the governments (65 out of 78) the condition was "above satisfactory." In nine governments it was "satisfactory," and only in four governments "unsatisfactory." The absence of snow and frost in many governments causes fear for the well-being of the crops, as they may suffer from wet and cold. Little change has taken place as compared with their condition a month ago.

United States.—The weather is seasonable. The Government report on the condition of the winter wheat on February 1st states that the fields are mostly protected by snow, and there has been very little alternate freezing and thawing. (*Beerbohm's Evening Corn Trade List*, February 9th, 1912.)

Production of Cider and Perry in France.—According to the report of the French Ministry of Agriculture, the production of cider and perry in France during 1911 is estimated at 481,766,000 gallons, as compared with 237,485,000 gallons in 1910. (*Journal Officiel*, January 12th, 1912.)

Prevalence of Animal Diseases on the Continent.

The following statement shows that, according to the information in the possession of the Board on February 1st, 1912, certain diseases of animals existed in the countries specified:—

Austria (for the period January 18th—24th).

Anthrax, Blackleg, Foot-and-Mouth Disease (total of 8,183 Höfe now infected), Glanders and Farcy, Rabies, Sheep-scab, Swine Erysipelas, Swine Fever, Tuberculosis

Belgium (for the period December 1st—15th).

Anthrax, Blackleg, Foot-and-Mouth Disease (358 "foyers" in 224 "communes"), Rabies, Sheep-scab.

Bulgaria (for the period December 29th—January 6th).

Anthrax, Glanders and Farcy, Rabies, Sheep-pox, Sheep-scab, Swine Fever.

Denmark (month of December).

Anthrax, Foot-and-Mouth Disease (278 cases), Swine Erysipelas.

France (month of December).

Anthrax, Blackleg, Foot-and-Mouth Disease (5,954 "étables" in 2,110 "communes"), Glanders and Farcy, Rabies, Sheep-pox, Sheep-scab, Swine Erysipelas, Swine Fever.

Germany (for the period January 1st—15th).

Foot-and-Mouth Disease (7,881 infected places in 3,133 parishes), Glanders and Farcy, Swine Fever.

Holland (month of December).

Anthrax, Foot-and-Mouth Disease (302 outbreaks in 11 provinces), Foot-rot, Rabies, Swine Erysipelas.

Hungary (for the period January 4th—10th).

Anthrax, Foot-and-Mouth Disease (total of 4,800 "cours" now infected), Glanders and Farcy, Rabies, Sheep-pox, Sheep-scab, Swine Erysipelas, Swine Fever.

Italy (for the period December 18th—24th).

Anthrax, Blackleg, Foot-and-Mouth Disease (142 new cases entailing 2,921 animals), Glanders and Farcy, Sheep-scab, Swine Fever.

Montenegro (for the period October 1st—15th).

Foot-and-Mouth Disease (96 "étables" infected in 13 "communes"), Glanders.

Norway (month of December).

Anthrax, Blackleg.

Roumania (for the period December 20th—January 5th).

Dourine, Foot-and-Mouth Disease, Glanders and Farcy, Pleuro-pneumonia, Rabies, Sheep-pox, Swine Erysipelas, Swine Fever.

Russia (month of September).

Anthrax, Foot-and-Mouth Disease (281,448 animals in 4,063 "communes"), Glanders and Farcy, Pleuro-pneumonia, Rabies, Sheep-pox, Swine Erysipelas, Swine Fever.

Servia (for the period December 23rd—30th).

Glanders and Farcy.

Spain (month of November).

Anthrax, Blackleg, Dourine, Foot-and-Mouth Disease (102,972 animals), Glanders and Farcy, Pleuro-pneumonia, Rabies, Sheep-pox, Sheep-scab, Swine Erysipelas, Tuberculosis.

to 39*s.* per 480 lb.; Russian, 36*s.* to 41*s.*, according to cleanness and quality; and Canadian, 34*s.* to 43*s.* 6*d.*—an immense range. At Liverpool, American red winter, the leading sort there, was held for 7*s.* 9*d.* per cental.

Flour.—Shipments of United States and Canadian sorts in January did not exceed 370,000 sacks to England and Europe. At least half a million were expected, and thus the market has been gradually hardening for both these sorts. The advance of Town Whites to 31*s.* was a corollary of the rise in wheat which had by some been regarded as overdue, even on late December wheat quotations. It has carried with it Town Households up to 28*s.*, No. 2 Households to 26*s.* 9*d.*, and wholemeal to 28*s.*, and while country flour, owing to large supplies into London, is little dearer on the month, February expectations on the 1st of the month were certainly in sellers' favour. The supply on passage, 134,000 sacks, is very small.

Barley.—Remarkable averages have continued to be recorded from some of the counties, Kentish returns in especial being high. Part of the ostensible rise in barley must probably be attributed to the unusually large use of feeding quality on the farm. If the grower only sends to market malting grade a high average naturally results. Towards the end of January a good demand for seed corn was manifested. Imported barley has been in full average supply, but inquiry is so much above the average for barley meal that grinding sorts are dearer than ever. The profits on pig fattening are affected by this rise in feeding barley. Russia in January shipped 896,000 qr., Europe S.E., 186,000 qr., but the Continent has continued to buy freely, and only 330,000 qr. were on passage to the United Kingdom at the end of the month. Prices at the close included 28*s.* 6*d.* to 29*s.* for 400 lb. Russian, and 27*s.* 6*d.* to 28*s.* for Indian.

Oats.—The excellent demand for 304 lb. descriptions has met with curiously little response from shippers. During January Russia sent off 722,000 qr., Europe S.E. 131,000 qr., and Argentina 162,000 qr., but these were a decidedly smaller aggregate than the figures for January, 1911, when prices were some shillings lower, and the crops of Argentina and Canada smaller. The last-named country has hardly yet begun to ship a crop estimated as giving a clear seven million quarters exportable surplus; yet the price which Mark Lane is now bidding for Canadian 320 lb. oats is 22*s.* 6*d.* per qr. The month closed with only 150,000 qr. of oats on passage from all sources, but La Plata was understood to have contracted for about half a million quarters to be shipped before the close of February. An even larger trade is expected for March.

Maize.—The United States in January shipped 596,000 qr. only, against 920,000 qr. and 837,000 qr. in the two preceding Januarys. This partial failure of expected new crop shipments caused flat and mixed corn to appreciate, and a dear market was experienced where easier buying had been the anticipation. Round corn was shipped from Russia to the extent of 390,000 qr., and 798,000 qr., a very large total, was exported by Europe S.E. The total world shipments, despite the efforts of the European region, were decidedly below the average, and the month closed with less than 400,000 qr. on the high seas. Prices at Mark Lane were 31*s.* for American, Odessa, and Calcutta,

33*s*. 6*d*. for white African. Burma offered prompt shipments at £6 16*s*. 3*d*. per ton direct to London, cost, freight, and insurance.

Oilseeds.—American competition for linseed is less than it was at this time last year, and the new crop in Argentina is decidedly heavier. Prices accordingly are expected during the next few months to be easier than they have recently been. There seems, however, to be little practical anticipation of linseed falling below 16*s*. per cwt. either for Argentine or for Calcutta, while 17*s*. to 18*s*. is likely to be demanded for English, Russian, and Bombay, which sorts are the pick of the market.

Various.—The general dearness of fattening foods leads to beet sugar being in request; 15*s*. per cwt. is about the lowest quotation. Some mixed feeding stuffs may be quoted as follows:—Pigeon beans, 50*s*. per 532 lb.; small round peas, 74*s*. per 504 lb.; Indian chick peas, 30*s*. per 504 lb.; Essex rye, 33*s*. per 480 lb.; Indian millet, 28*s*. per 480 lb.; Sussex gores, 88*s*. per 532 lb.; Argentine canaryseed, 45*s*. per 464 lb.; and Russian buckwheat, 7*s*. 6*d*. per cental. There is a busier trade than usual in the minor products.

THE LIVE AND DEAD MEAT TRADE IN JANUARY.

A. T. MATTHEWS

Fat Cattle.—Trade ruled very firm throughout the month. Supplies were moderate, and the average condition of animals offered was fully as good as could be expected in view of the exceptional difficulties of feeders, owing to the scarcity of roots and the very high cost of concentrated feeding stuffs. A notable feature at the Metropolitan Market was the unusually liberal supplies of Irish bullocks, the condition of which was quite equal to the normal. At the market held on the 22nd, fully half of the cattle exposed had been shipped from Dublin and Waterford. These useful cattle have helped to compensate for the falling off in the usual supply from the Norfolk yards.

The following averages for cattle in English markets are calculated for the four weeks ended January 25th:—Shorthorns, 8*s*. 8*d*. for first, and 7*s*. 9*d*. for second quality, against 8*s*. 9*d*. and 7*s*. 9*d*. in December; Herefords, 8*s*. 11*d*. and 8*s*. 3*d*., against 8*s*. 9*d*. and 8*s*.; Devons, 9*s*. and 7*s*. 11*d*., against 8*s*. 11*d*. and 7*s*. 11*d*.; Welsh Runts, 8*s*. 8*d*. and 7*s*. 10*d*., against 8*s*. 6*d*. and 7*s*. 9*d*.; Polled Scots, 9*s*. and 8*s*. 3*d*., against 8*s*. 11*d*. and 8*s*. 3*d*. per 14 lb. stone. It will be seen that in most of these classes there was some advance. As regards the immediate future, it is considered improbable that the present supplies can be maintained.

Veal Calves.—There was a very good demand for the time of year, and average prices were very steady. These were 8½*d*. and 7½*d*. per lb. in the leading British markets, this being an advance of ¼*d*. per lb. on the prices ruling in December.

Fat Sheep.—For the first three weeks of the new year values remained about stationary, but in the fourth week there was a very decided advance of ½*d*. per lb. in the average of British markets.

Under the present conditions any general improvement in the condition and quality was out of the question, and large numbers of tegs have been coming forward for forced sale, which, in ordinary seasons, would not be sold till March and April. Consequently they are only half fattened, and fetch very poor prices per head. It is highly probable that, such being the case, the values per lb. have been under-estimated, and butchers have complained very much of disappointment at results when sheep have come to be weighed. We are thus mortgaging our future supplies, and a serious shortage is looked for in the spring. The January averages for Downs in about twenty English markets were 8¾*d.*, 7¼*d.*, and 5¾*d.* for the three qualities, and 7½*d.*, 6½*d.*, and 5*d.* for Longwools. This was an improvement of about ¼*d.* on the December prices. A falling off of about 2,000 head in the Islington supplies on the fourth Monday caused a sharp advance in prices, and some of the choicer pens realised as much as 9*d.* per lb. Looking back to the summer prices of last year, it will be found that sheep are now about 1*d.* per lb. dearer than at the lowest point.

Fat Pigs.—After many months of continuous decline, bacon pigs showed a small recovery, averaging in about thirty British markets 6*s.* 3*d.* per 14 lb. for prime small, and 5*s.* 8*d.* for larger pigs. Supplies at some markets show signs of falling off.

Carcass Beef—British.—In the first week fresh-killed beef was dearer than at Christmas in the London markets, and whole sides of Scotch made up to 7*d.* per lb., while English fetched 6¾*d.* The latter was of better quality, relatively, than is often the case at Smithfield. Both met a good, steady trade throughout, but the average prices differed little from those of December. These were 7¼*d.* and 7*d.* per lb. for short, and 6½*d.* and 6¾*d.* for long sides of Scotch, and 6½*d.* and 6*d.* for English of first and second quality.

Port-Killed Beef.—Deptford-killed American has again sold well, and has realised in the Central Market exactly the same as English.

Chilled Beef.—North American chilled was again conspicuous by its absence, and Argentine supplies were comparatively moderate. Trade was therefore steady, and prices ruled rather higher than in December, the averages being, for hindquarters, 3*s.* 6*d.* per 8 lb. for first, and 3*s.* for second quality. Forequarters also advanced and realised 2*s.* 4*d.* and 2*s.* per stone.

Frozen Beef.—This class of beef was quietly dealt in, the demand being steady. Its value, however, like that of all other descriptions of beef, tended upwards. Hindquarters averaged 2*s.* 7*d.* per stone for first, and 2*s.* 5*d.* for second quality, and forequarters 2*s.* and 1*s.* 10*d.*

Carcass Mutton—Fresh-Killed.—The trade in British and Dutch mutton has been singularly lifeless, and prices for home-grown have been relatively lower at the dead-meat market than for live sheep at Islington. Scotch sold slowly, and averages were lower than in December. The highest price for small tegs was 4*s.* 6*d.* per stone, or 6¾*d.* per lb., and the averages for the month 4*s.* 5*d.* and 4*s.* per stone for first and second quality. English made 3*s.* 8*d.* to 4*s.*, and Dutch 3*s.* 7*d.* to 4*s.* A little lamb has sold at 10*d.* to 11*d.* per lb.

Frozen Mutton and Lamb.—New Zealand mutton sold steadily at 2*s.* 6*d.* to 3*s.* per 8 lb., and Argentine and Australian at 2*s.* 2*d.* to

2*s.* 5*d.* Canterbury lamb fetched about 3*s.* 8*d.* during the first three weeks, but in the fourth some new season produce arrived which made 4*s.* per stone.

Veal.—There was considerable scarcity of good veal in London, and only in the third week were quotations for British less than 6*s.* and 5*s.* 8*d.* per stone for first and second quality.

Pork.—There were full supplies of both British and Dutch pork and trade was quiet. The former averaged 4*s.* 2*d.* and 3*s.* 9*d.* per stone for first and second quality, and the latter about 2*d.* per 8 lb. less.

Late Markets.—At the Metropolitan Market on the 29th there was no change in the value of cattle, but prime small sheep were dearer, Southdowns realising 9¼*d.* per lb.

There was a very slow trade for dead meat at the London Central Market on the 31st, but there was no material change in prices.

THE PROVISION TRADE IN JANUARY.

HEDLEY STEVENS.

Bacon.—The New Year opened with firmer markets for all descriptions of long sides, and a moderate consumptive demand, but by the end of January quotations were a little lower. All other cuts, especially Cumberlands, bellies, and hams, were in very poor demand, and prices showed greatly in favour of buyers. The demand for hams at this time of year is usually small, but during the past month they were practically unsaleable, and arrivals had to be placed in cold store to await improved conditions of trading. The consumer is not at present getting the full benefit of the lower prices which are ruling, as owing to the fact that the retailer has been selling for many months past at either cost or a loss, he is anxious to recoup himself as far as possible before placing his prices more in line with wholesale values. The arrivals of long sides from Denmark and Russia were fairly free during the month, and at the prices demanded met with a ready sale. On the other hand, the shipments from America and Canada, although of moderate quantities, were more than sufficient for the demand. Prices for spot goods are below those asked by the packers, and in consequence there was very little, if any, contracting done during the month. At all the American markets the receipts of hogs continue much in excess of those at the same time last year. The values at Chicago during the month ranged from $5.60 to $6.40, against $7.60 to $8.25 last year, and $8.00 to $8.90 two years ago.

English pigs are still offered in small quantities only, but prices show little change.

Cheese.—A moderate trade passed during the month, and there was very little alteration in prices. Some holders tried to force up the values of Canadians still further, and this cheese was dearer in January than in December, in spite of the free arrivals of New Zealand makes. At present spot prices are from 14*s.* to 17*s.* per cwt. above those current at the same time last

year, and it is felt by many operators that they are as high as they are likely to go, but others think, with the visible supplies in England, Canada, and the United States much smaller than for many years past, we shall go to 80*s*. before the beginning of April for Canadian and New Zealand makes, as even with the reduced consumption on account of the high prices, there will not be sufficient cheese to fill requirements until the new makes arrive. Some further purchases of best Canadian makes have been made with Canada at from 74*s*. to 75*s*. c.i.f., and practically all stocks available for export have now been sold. Cables from New Zealand still report dry weather, so it is thought that there will not be a large increase in the shipments from that country, as anticipated.

At the end of the month the estimated stock of Canadian cheese at the three principal distributing centres (London, Liverpool, and Bristol) was 206,000 cheese, against 266,000 at the same time last year, and 245,000 two years ago. The stock of New Zealands was 10,000 crates in London and Bristol, against 14,000 at the same time last year.

English cheese was in fair demand at extremely high prices, present rates being from 20*s*. to 24*s*. per cwt. over those current at the same time last year. Supplies were difficult to obtain.

Butter.—Prices fluctuated during the month, and at the close were about 2*s*. to 4*s*. higher than at the end of December. They still show a range of values from 26*s*. to 30*s*. over those of January, 1911, however. It is contended by many interested in the trade that the present prices are the result of the "bull" operations of large speculators, but it is not entirely so. On January 1st, 1911, the public cold stores in London, Liverpool, and Bristol had heavy stocks of butter kept over from the previous summer (which was a wet one), and the losses incurred by the wholesale merchants were very great, the goods having to be sold at under cost of production. We may have slightly reduced prices, but until May next we must expect to have about the present abnormal rates, as a result of the past summer's drought in England and on the Continent. We cannot expect any further shipments, either from Canada or the United States this season, as all available stocks are required for home consumption in those countries, at prices relatively above those current in this country.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of January, 1912.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	England. First Quality.	England. Second Quality.	Scotland. First Quality.	Scotland. Second Quality.
FAT STOCK:—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle:—	s. d.	s. d.	s. d.	s. d.
Polled Scots	8 11	8 2	41 9	38 3
Herefords	8 11	8 3	—	—
Shorthorns	8 8	7 9	40 9	37 6
Devons	9 0	7 11	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	8¼	7½	9	7
Sheep:—				
Downs	8¼	7¼	—	—
Longwools	7½	6½	—	—
Cheviots	8½	7½	8	7
Blackfaced	8½	7¼	7½	6½
Cross-breds	8	7	8¼	7¼
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs:—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	6 4	5 9	6 1	5 6
Porkers	7 0	6 5	6 7	6 0
LEAN STOCK:—	per head.	per head.	per head.	per head.
Milking Cows:—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	21 12	17 16	22 2	18 12
,, —Calvers... ...	21 2	17 5	21 1	17 12
Other Breeds—In Milk ...	17 19	15 7	18 17	15 6
,, —Calvers ...	—	11 15	19 16	16 0
Calves for Rearing	2 1	1 11	2 17	2 1
Store Cattle:—				
Shorthorns—Yearlings ...	9 13	8 8	10 9	8 17
,, —Two-year-olds .	13 10	11 16	14 8	12 17
,, —Three-year-olds	16 15	15 9	16 5	13 14
Polled Scots—Two-year-olds	—	—	17 5	14 11
Herefords— ,,	15 17	13 10	—	—
Devons— ,,	14 14	12 11	—	—
Store Sheep:—				
Hoggs, Hoggets, Tegs, and Lambs—	s. d.	s. d.	s. d.	s. d.
Downs or Longwools ...	33 9	26 10	—	—
Scotch Cross-breds ...	—	—	30 6	24 9
Store Pigs:—				
8 to 10 weeks old	13 7	9 9	17 6	13 5
12 to 16 weeks old	22 3	16 3	—	—

* Estimated carcass weight.

† Live weight

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of January, 1912

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	Birmingham.	Liverpool.	London.	Manchester.	Edinburgh.	Glasgow.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	58 6	59 0	61 0	57 0	59 0*	60 6*
	2nd	54 6	54 0	56 6	53 6	54 0*	57 6*
Cow and Bull ...	1st	48 6	46 6	48 6	49 6	50 0	48 6
	2nd	43 6	42 0	43 6	45 6	44 6	44 6
U.S.A. and Canadian :—							
Port Killed ...	1st	58 6	59 0	61 0	58 6	—	—
	2nd	53 6	53 6	57 6	—	—	—
Argentine Frozen—							
Hind Quarters...	1st	36 0	35 6	36 6	35 6	35 6	36 6
Fore ,, ...	1st	27 6	27 0	28 6	27 0	27 6	27 6
Argentine Chilled—							
Hind Quarters...	1st	46 6	46 6	47 0	48 0	47 0	46 6
Fore ,, ...	1st	31 6	29 6	32 6	29 6	32 0	32 0
Australian Frozen—							
Hind Quarters...	1st	35 6	34 0	36 0	34 0	—	34 6
Fore ,, ...	1st	28 0	25 0	28 0	25 0	—	26 6
VEAL :—							
British	1st	61 0	77 0	81 6	77 0	—	70 0
	2nd	56 0	69 6	76 0	70 6	—	—
Foreign	1st	—	—	81 6	—	80 0	65 6
MUTTON :—							
Scotch	1st	—	69 6	62 0	68 0	61 6	68 0
	2nd	—	64 6	56 0	64 6	54 0	48 0
English	1st	60 6	62 6	56 6	63 6	—	—
	2nd	56 6	56 6	52 0	57 6	—	—
Argentine Frozen ...	1st	35 0	35 0	34 0	35 0	34 6	34 0
Australian ,, ...	1st	33 0	32 6	33 0	32 6	—	32 6
New Zealand ,, ...	1st	—	—	42 0	—	—	—
LAMB :—							
British	1st	—	—	102 6	—	—	—
	2nd	—	—	93 6	—	—	—
New Zealand ...	1st	50 0	49 0	51 6	49 0	—	—
Australian	1st	47 0	40 0	45 0	40 0	—	39 6
Argentine	1st	43 6	41 0	45 0	41 0	—	39 6
PORK :—							
British	1st	60 6	62 0	57 6	63 0	55 6	56 0
	2nd	56 0	53 6	52 0	57 6	48 6	50 6
Foreign	1st	—	—	54 0	—	—	—

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1910, 1911 and 1912.

Weeks ended (*in* 1912).	Wheat.						Barley.						Oats.					
	1910.		1911.		1912.		1910.		1911.		1912.		1910.		1911.		1912.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
Jan. 6 ...	33	6	30	5	33	2	24	11	23	11	33	3	17	2	17	0	20	7
,, 13 ...	33	8	30	8	33	1	24	11	23	10	33	0	17	7	17	2	20	8
,, 20 ...	33	9	30	11	33	4	24	11	24	4	33	3	17	6	17	4	20	11
,, 27 ...	33	6	30	11	33	7	25	0	24	5	33	1	17	4	17	3	21	1
Feb. 3 ...	33	7	30	9	33	8	24	10	24	5	32	10	17	7	17	5	21	3
,, 10 ...	33	4	30	5			24	9	24	6			17	11	17	5		
,, 17 ...	33	0	30	3			24	6	24	7			18	0	17	6		
,, 24 ...	32	7	30	2			24	2	24	9			17	10	17	7		
Mar. 2 ...	32	7	30	0			24	6	25	0			18	1	17	5		
,, 9 ...	32	6	30	1			24	1	25	0			18	0	17	5		
,, 16 ...	32	6	30	1			23	6	24	11			18	0	17	6		
,, 23 ...	32	9	30	2			23	7	25	0			17	11	17	5		
,, 30 ...	33	0	30	3			23	8	24	11			18	0	17	5		
Apl. 6 ...	33	6	30	4			23	1	24	7			17	11	17	7		
,, 13 ...	33	7	30	3			23	5	25	2			18	3	18	3		
,, 20 ...	33	7	30	4			23	0	25	5			18	3	17	10		
,, 27 ...	33	0	30	11			22	10	25	5			18	3	18	3		
May 4 ...	32	6	31	4			22	7	25	7			18	2	18	6		
,, 11 ...	32	1	31	8			22	0	25	1			18	1	19	0		
,, 18 ...	31	10	32	6			21	8	25	4			17	8	19	2		
,, 25 ...	31	3	32	8			21	4	25	0			17	10	19	5		
June 1 ...	30	2	32	5			21	8	24	10			17	10	19	5		
,, 8 ...	29	1	32	4			20	9	25	7			17	10	19	7		
,, 15 ...	29	0	32	3			18	11	23	11			18	0	19	8		
,, 22 ...	29	4	31	11			20	1	23	9			17	9	19	10		
,, 29 ...	29	9	31	10			19	11	24	5			17	7	19	9		
July 6 ...	30	4	32	1			19	5	25	10			17	4	19	9		
,, 13 ...	31	1	32	3			21	3	25	10			17	7	19	11		
,, 20 ...	31	11	32	5			19	9	24	3			17	5	19	5		
,, 27 ...	33	5	32	5			20	10	23	8			18	1	19	7		
Aug. 3 ...	33	9	32	0			20	5	24	4			18	3	18	2		
,, 10 ...	33	5	31	6			20	4	26	9			18	0	18	0		
,, 17 ...	32	11	31	6			20	11	27	8			17	11	17	10		
,, 24 ...	32	7	31	8			20	10	28	10			17	2	18	0		
,, 31 ...	32	2	31	7			22	10	28	4			17	2	18	3		
Sept. 7 ...	31	11	31	10			23	3	28	4			17	2	18	1		
,, 14 ...	30	11	32	0			24	3	29	0			16	6	18	5		
,, 21 ...	30	2	32	4			24	2	29	11			16	3	18	9		
,, 28 ...	30	1	32	6			24	4	30	5			16	4	19	1		
Oct. 5 ...	30	1	32	7			24	7	30	9			16	3	19	5		
,, 12 ...	30	2	32	9			25	1	31	0			16	2	19	10		
,, 19 ...	30	4	32	9			25	3	31	5			16	1	19	11		
,, 26 ...	30	4	33	1			25	4	31	7			16	2	20	6		
Nov. 2 ...	30	4	33	4			25	6	31	10			16	2	20	8		
,, 9 ...	29	11	33	4			25	4	32	7			15	11	20	11		
,, 16 ...	29	8	33	1			25	1	32	10			16	1	21	0		
,, 23 ...	29	11	33	0			24	10	33	5			16	4	20	10		
,, 30 ...	30	6	32	10			24	7	33	10			16	7	20	11		
Dec. 7 ...	30	9	32	9			24	3	34	0			16	9	20	9		
,, 14 ...	30	7	32	11			23	9	33	5			16	10	20	9		
,, 21 ...	30	7	32	9			23	10	33	5			16	9	20	8		
,, 28 ...	30	5	33	0			23	9	33	4			16	9	20	7		

NOTE.—Returns of purchases by weight or weighed measure are converted to Imperial Bushels at the following rates: Wheat, 60 lb.; Barley, 50 lb.; Oats, 39 lb. per Imperial Bushel.

AVERAGE PRICES of **Wheat, Barley,** and **Oats** *per Imperial* Quarter in FRANCE, BELGIUM, and GERMANY, and at PARIS, BERLIN, and BRESLAU.

—		Wheat.		Barley.		Oats.	
		1911.	1912.	1911.	1912.	1911.	1912.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France:	January	46 11	44 4	26 3	28 8	21 0	22 9
Paris:	*January*	48 3	46 11	26 2	28 8	22 9	23 5
		1910.	1911.	1910.	1911.	1910.	1911.
Belgium:	November	32 3	33 10	22 6	27 11	19 7	22 9
	December	32 9	34 1	22 10	28 11	19 2	23 4
Germany:	November	40 6	42 9	27 11	35 1	20 10	25 0
	December	40 8	43 2	27 8	35 9	20 8	25 3
Berlin:	November	43 0	43 7	—	—	20 6	25 2
	December	43 9	43 9	—	—	20 4	25 10
Breslau:	November	37 9	39 9	26 6* / 22 11†	32 6* / 27 7†	19 9	23 6
	December	37 10	39 11	26 8* / 22 11†	32 10* / 27 7†	19 7	24 1

* Brewing. † Other.

NOTE.—*The prices of grain in France have been compiled from the official* weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the German quotations are taken from the *Deutscher Reichsanzeiger*, the prices for the German Empire representing the average of the prices at a number of markets.

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of January, 1911 and 1912.

—	Wheat.		Barley.		Oats.	
	1911.	1912.	1911.	1912.	1911.	1912.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London...	31 10	34 6	23 3	32 3	18 9	22 11
Norwich	30 10	32 11	22 11	33 1	17 8	21 2
Peterborough	30 4	32 9	23 7	30 4	16 10	21 2
Lincoln...	30 2	33 4	24 10	32 11	17 4	21 3
Doncaster	30 6	33 0	23 5	32 6	16 7	20 7
Salisbury	30 5	32 10	23 0	33 4	17 4	20 4

ERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of January, 1912.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	Bristol.		Liverpool.		London.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*
TTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
itish ...	17 0	15 9	—	—	18 0	16 0	16 6	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
'sh *Factory*	—	—	*123 6*	*119 6*	—	—	—	—
mish ..	—	—	137 6	135 0	136 6	135 0	133 6	—
ench ...	—	—	—	—	145 6	142 6	—	—
ssian ...	127 6	124 0	127 0	124 0	129 0	126 6	122 0	—
stralian ...	134 0	131 6	133 0	130 0	131 6	128 6	133 6	131 0
w Zealand	136 0	132 6	135 0	133 0	133 6	130 6	136 6	135 0
gentine ..	134 0	132 0	132 0	130 0	130 0	127 0	—	—
EESE :—								
itish—								
Cheddar ...	93 0	85 0	88 0	84 0	96 0	87 6	79 0	77 0
			120 lb.	120 lb.	120 lb.	120 lb.		
Cheshire ...	—	—	88 6	82 0	95 6	86 0	—	—
			per cwt.	per cwt.	per cwt.	per cwt.		
nadian ...	74 6	73 0	74 0	72 6	75 6	73 6	74 6	—
CON :—								
sh	58 6	55 0	59 0	54 6	60 0	57 6	59 0	—
nadian ...	52 6	50 0	52 6	50 0	53 0	50 6	51 6	—
MS :—								
mberland ...	—	—	—	—	106 0	93 0	—	—
sh	—	—	—	—	109 6	97 6	78 0	75 0
nerican (long cut)	54 6	51 6	55 0	51 6	58 0	54 0	56 6	—
GS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
itish ...	18 4	16 8	—	—	16 8	14 9	—	—
sh	15 9	15 2	14 9	13 7	14 6	12 6	14 4	13 4
nish ...	—	—	14 7	13 7	16 0	14 9	14 6	14 0
TATOES :—	per ton.	per ton.	per ton.	per ton.	per ton	per ton.	per ton.	per ton.
ward VII.	90 0	80 0	63 6	60 0	80 0	70 0	—	—
ngworthy ...	85 0	80 0	81 6	76 6	100 0	92 6	70 0	65 0
-to-Date ...	85 0	74 0	58 6	55 0	80 6	70 6	60 0	55 0
Y :—								
over ...	115 0	105 0	118 6	96 0	122 0	100 0	86 0	81 0
adow ...	110 0	100 0	—	—	116 6	94 6	—	—

DISEASES OF ANIMALS ACTS, 1894 to 1911.

NUMBER OF OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

Disease.	January. 1912.	January. 1911.
Anthrax :—		
Outbreaks	92	85
Animals attacked	101	96
Foot-and-Mouth Disease :—		
Outbreaks	—	—
Animals attacked	—	—
Glanders (including Farcy) :—		
Outbreaks	13	18
Animals attacked	33	63
Parasitic Mange :—		
Outbreaks	619	—
Animals attacked	1,743	—
Sheep-Scab :—		
Outbreaks	63	123
Swine-Fever :—		
Outbreaks	229	141
Swine Slaughtered as diseased or exposed to infection ...	2,540	1,523

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

Disease.	January. 1912.	January. 1911.
Anthrax :—		
Outbreaks	—	1
Animals attacked	—	1
Glanders (including Farcy) :—		
Outbreaks	—	—
Animals attacked	—	—
Parasitic Mange :—		
Outbreaks	8	8
Sheep-Scab :—		
Outbreaks	86	96
Swine-Fever :—		
Outbreaks	11	17
Swine Slaughtered as diseased or exposed to infection ...	146	281

SELECTED CONTENTS OF PERIODICALS.

Agriculture, General and Miscellaneous—

Die Aufgaben der Moorkultur in Österreich, *Dr. Wilhelm Bersch*. (Ztschr. Moorkultur u. Torfverwertung, Heft 6, 1911.) [63.142.]

Toxic Effects of "Alkali Salts" in Soils on Soil Bacteria. I. Ammonification. *C. B. Lipman*. (Centbl. Bakt. [etc.], 2e Abt., 32 Band, No. 1–2, Dezember, 1911.) [63.115.]

Sur la pénétration des engrais solubles dans les sols, *A. Demolon et G. Brouet*. (Ann. Sci. Agron., Décembre, 1911.) [63.167.]

Untersuchungen über die "Wasserführung" des Bodens, *H. Puchner*. (Internat. Mitt. für Bodenkunde, Band I., Heft 2, 1911.) [63.113.]

Ein Beitrag zur Erkenntnis der Veränderungen der sog. physikalischen *Bodeneigenschaften durch Frost, Hitze und die Beigabe einiger Salze*, *Dr. W. Czermak*. (Landw. Vers. Stat., Band LXXVI., Heft I. u. II., 1912.) [63.113.]

Beiträge zur Morphologie und Biologie der Knollchenbakterien der Leguminosen, *Hugo Zipfel*. (Centbl. Bakt. [etc.], 2e Abt., 32 Band, No. 3–5, Dezember, *1911.*) [63.165.]

Field Crops—

Au sujet de la rénovation de la pomme de terre, *Dr. Heckel*. (Bul. Mens. Off. Renseig. Agr. [Paris], Octobre, 1911.) [63.512–194.]

Utilisation of Sudan Dura Grain in Europe. [63.319.] Cultivation, Production, and Utilisation of *Sesamum* Seed. [63.342.] (Bul. Imperial Inst., Vol. IX., No. 3, 1911.)

Über die Keimenergie des Rotkleesamens, *B. Kajanus*. [63.1051; 63.33(*b*).] (Landw. Jahrb., XLI. Band, Heft 3/4, 1911.)

Horticulture—

La culture de la Truffe en France, *F. Fournet*. (Rev. Gén. Agron., Août, *1911.*) [63.511.]

Pollination in Orchards.—I., *F. J. Chittenden*. (Jour. Roy. Hort. Soc., Vol. XXXVII., Part 2, December, 1911.) [63.41(04).]

Nouvelle contribution à l'étude de la nutrition du champignon de couche. Composition des fumiers employés à sa culture, *A. Hébert* et *F. Helm*. (Ann. Sci. Agron., Novembre, *1911.*) [63.518.]

Plant Diseases—

Tumour (*Chrysophlyctis endobiotica*) and Canker (*Spongospora solani*) in Potato, *A. S. Horne*. (Jour. Roy. Hort. Soc., Vol. XXXVII., Part 2, December, 1911.) [63.24.]

Methods of determining the toxicity of hydrocyanic acid gas, *G. A. Coleman*. (Jour. Econ. Ent. [Concord, N.H.], December, 1911.) [63.294.]

Entomologie forestière à l'usage des forestiers, des reboiseurs et des propriétaires de bois, *A. Barbey*. (Ann. Sci. Agron., Décembre, 1911.) [63.27–49.]

Versuche über die Wachstumbedingungen und Verbreitung der Fäulnispilze des Lagerobstes, *O. Schneider*. (Centbl. Bakt. [etc.], 2e Abt., 32 Band, No. *6–12*, Januar, *1912.*) [63.24–41.]

Live Stock—

The Revival of Goat Breeding in Germany. (Dept. Agr. and Tech. Instr. Ireland Jour., October, 1911.) [63.63.]

La mensuration des animaux primés dans les concours, *Ch. Voitellier*. (Bul. Mens. Off. Renseig. Agr. [Paris], Septembre, 1911.) [63.6(004).]

Cost of Horse Power, *G. Turnbull*. (Jour. Land Agents' Soc., January, 1912.) [63.61; 338.58.]

Studies in Tensile Strength and Elasticity of the Wool Fibres. I. The Probable Error of the Mean, *J. A. Hill.* (Agr. Expt. Sta., Wyo., Ann. Rpt., 1910–11.) [63.761.]

Beiträge zur Physiologie der Ernährung wachsender Tiere. III. Der Eiweissbedarf wachsender Rinder. Fütterungsversuche, ausgeführt in den Jahren 1908–9 und 1910, *G. Fingerling.* (Landw. Vers. Stat., Band LXXVI., Heft I. u. II., 1912.) [612.394; 63.604.]

Dairying and Food, General—

The fat globules in milk in relation to churning, *W. F. Cooper, W. H. Nuttall,* and *G. A. Freak.* (Jour. Agr. Sci., Vol. IV., Part 2, October, 1911.) [63.712.]

Untersuchungen zur Buttersäuregärung, *A. Kirow.* (Centbl. Bakt. [etc.], 2e Abt., 31 Band, No. 16–22, November, 1911.) [576.8; 63.721.]

Le Système de Contrôle du Beurre en Hollande, *R. Leboucq.* (Rev. Gén. Agron., Septembre, 1911.) [614.32.]

Veterinary Science—

Oxidation of arsenites to arsenates in cattle-dipping tanks, *W. F. Cooper* and *G. A. Freak.* (Jour. Agr. Sci., Vol. IV., Part 2, October, 1911.) [614.4.]

Notes on the life-history of the tick parasite, *Hunterellus hookeri, H. P. Wood.* (Jour. Econ. Ent. [Concord, N.H.], October, 1911.) [59.169(b).]

Notes on Ticks. (1) *Ixodes caledonicus,* Description of Male, together with Considerations Regarding the Structure of the Foot in Male *Ixodes.* (2) Types of Parasitism in Ticks, illustrated by a Diagram, together with some Remarks upon Longevity in Ticks. (3) Regarding the Loss of Life in Ticks occurring on Wandering Hosts, *George H. F. Nuttall.* (Parasitology, Vol. 4, No. 3, October, 1911.) [59.169(b).]

Birds, Poultry, Bees, &c.—

Helianthi als Futterpflanze für das Hofgeflügel, *Ehlers.* (Mitt. Deut. Landw. Gesell., 28 Oktober, 1911.) [63.65(04).]

Die Bekämpfung der Feldmausplage, *Hiltner* und *Korff.* (Prakt. Bl. Pflanzenbau u. Schutz, September–Oktober, 1911.) [63.269.]

The Wax-Moth (*Galleria mellonella*), *T. B. Fletcher.* (Agr. Jour. India, October, 1911.) [63.81.09.]

Forestry—

On the best method of Planting at High Altitudes and in Exposed Situations, and the best Species of Trees to plant there with the object of procuring (*a*) Shelter for Stock, and (*b*) A profitable Timber Crop, *A. W. B. Edwards.* (Trans. Roy. Scot. Arbor. Soc., Vol. XXVI., Part I., January, 1912.) [63.49(04).]

Thorn Hedges and their Management, *W. H. Whellens.* (Trans. Roy. Scot. Arbor. Soc., Vol. XXVI., Part I., January, 1912.) [63.499.]

Economics—

Le Crédit agricole en Belgique. [332.71(493).] Les salaires agricoles en Belgique. [331.] (Études d'Économie Rurale, part *E. Vliebergh.*)

Rural Credit Banks. (Cent. Land Assoc., Off. Circ., No. 5, October, 1911.) [332.71(04).]

Small-Holdings and the Small-Holder, *T. Smith.* (Jour. Roy. Hort. Soc., Vol. XXXVII., Part 2, December, 1911.) [333.38(42).]

English Rural Land Questions, *L. L. Price.* (Econ. Jour., December, 1911.) [333.5; 33.]

The Burden of Upkeep on Agricultural Estates and Relief from Income Tax under Section 69 of the Finance Act, 1909–10, *W. A. Haviland.* (Trans. Surv. Inst., Vol. XLIV., Part III., 1911.) [336.24.]

ADDITIONS TO THE LIBRARY.

Agriculture, General and Miscellaneous—

Michigan Agricultural Experiment Station.—Bull. 265:—Fertiliser Analyses. (43 pp.) East Lansing, Michigan, 1911. [343.53(*d*).]

Wisconsin Agricultural Experiment Station.—Research Bull. 16:—The Place of Economics in Agricultural Education and Research. (93–130 pp. and charts.) Madison, Wisconsin, 1911. [33; 37:63.]

New Zealand, Agricultural, Pastoral, Stock, and Commerce Committee.—Seeds Sale Control Bill. Report and Minutes of Evidence. (11 pp.) Wellington, 1911. [343.53(*e*).]

U.S. Dept. of Agriculture, Office of Experiment Stations.—Bull. 242:—County Schools of Agriculture and Domestic Economy in Wisconsin. (24 pp. + 5 plates.) Washington, 1911. [37(73).]

Union of South Africa.—*Commission on the reorganisation of the departments of the Public Service.* Fourth Report (Department of Agriculture). (68 pp.) Pretoria, 1911. [35.68.]

Royal Commission on Ancient and Historical Monuments (Scotland).—Third Report and Inventory of Monuments and Constructions in the County of Caithness. (liii + 204 pp., plates and map.) London: Wyman and Sons, 1911. 7*s.* 6*d.* [63(41).]

Royal Commission on Ancient and Historical Monuments (Wales and Monmouthshire).—Inventory. I.—County of Montgomery. xxii and 194 pp., plates and map.) London: Wyman and Sons, 1911. 10*s.* [63.42.]

Widtsoe, John A.—Dry-Farming: A System of Agriculture for Countries under a Low Rainfall. [Rural Science Series.] (445 pp.) New York: The Macmillan Co., 1911. [63.19.]

Deutsche Landwirtschafts-Gesellschaft.—Arbeiten, Heft 198:—Leistung und Geldwert des Stalldüngers nach den Ergebnissen von acht Feldversuchen je vierjahriger Dauer. (333 pp.) Berlin: Paul Parey, 1911. [63.163.]

Board of Agriculture and Fisheries.—Copy of Further Papers relative to the International Agricultural Institute. [In continuation of Parliamentary Paper Cd. 5339.] [Cd. 5962.] (30 pp.) London: Wyman and Sons, 1911. 3*d.* [63.0611.]

Armstrong College.—Report on the Results of Rotation Experiments in the Counties of Northumberland and Durham. [Reprinted from the Newcastle Farmer's Club "Journal," 1911.] (7 pp.) [63(04).]

Kew, Royal Botanic Gardens.—Bull. of Miscellaneous Information, Additional Series IX.:—The Useful Plants of Nigeria, Part II. (177–342 pp.) London: Wyman and Sons, 1911. 2*s.* 6*d.* [58.19.]

Canada, Commission of Conservation.—Agricultural Work in Ontario. Unsanitary Housing. (59 pp.) [Reprinted from the Second Annual Report of the Commission, 1911.] [63(71); 333.32.]

Fream, W.—Elements of Agriculture: A Textbook prepared under the authority of the Royal Agricultural Society of England. [Eighth edition, edited by *J. R. Ainsworth-Davis.*] (692 pp.) London: J. Murray, 1911. 5*s.* net. [63(022).]

Cornell Agricultural Experiment Station.—Bull. 295:—An Agricultural Survey of Tompkins County, New York. (379–569 pp.) Ithaca, New York, 1911. [338.1; 63(73).]

Field Crops—

Lancaster County Council.—Farmers' Bull. 22:—Report of an Experiment on the Renovation of Poor Pasture Land. (25 pp.) Preston, 1911. [63.33–16.]

U.S. Dept. of Agriculture, Bureau of Chemistry.—Bull. 146:—Analyses of Sugar Beets, 1905 to 1910, together with Methods of Sugar Determination. (48 pp.) Washington, 1911. [63.343.2.]

U.S. Dept. of Agriculture.—Farmers' Bull. 466:—Winter Emmer. (24 pp.) Washington, 1911. [63.311.]

Hawaii Agricultural Experiment Station.—Bull. 24:—The Assimilation of Nitrogen by Rice. (20 pp.) Washington, *1911.* [63.319.]

Virginia Agricultural Experiment Station.—Bull. 183:—Work at the Tobacco Experiment Stations. (16 pp.) Blacksburg, Virginia, 1909. [63.3461.]

Union of South Africa.—Report on the Storage and Handling of Grain in Europe, United States of America, and Canada. (76 pp.) Pretoria, 1911. 1*s.* [63.31.]

Horticulture—

Savastano, L., e Parrozzanni, A.—*Di taluni ibridi naturali degli agrumi.* (37–63 pp. and plate.) [Extracted from Annali della R. Stazione di Agrumicoltura e frutticoltura. Vol. I. 1911.] [63.41(*e*).]

Ireland, Dept. of Agriculture and Technical Instruction.—The Management of a Cottage Garden, with a preface on the Labourer and his plot. (30 pp.) London: Wyman and Sons, 1911. 1*d.* [63(04); 63.5(04).]

Cornell Agricultural Experiment Station.—Bull. 298:—The Packing of Apples in Boxes. (681–693 pp.) [63.41(*a*).] Bull. 301:—Sweet Pea Studies.—I. (749–764 pp.) [63.52.] Ithaca, New York, 1911.

Plant Diseases—

U.S. Dept. of Agriculture, Bureau of Entomology.—Bull. No. 97, Part V.: —Notes on the Peach and Plum Slug. (*Caliroa* [*Eriocampoides*] *amygdalina,* Rohwer.) (79–102 pp. + plate.) [63.27.] Bull. 109, Part II.:—Papers on Insects affecting Vegetables. The Southern Beet Webworm (*Pachyzancla bipunctalis*). (13–22 pp.) [63.27.] Washington, *1911.*

Institut International d'Agriculture, Bureau des Renseignements Agricoles et des Maladies des Plantes.—L'Organisation actuelle du service de protection contre les maladies des plantes et les insectes nuisibles dans les divers pays. (223 pp.) Rome, 1911. [63.292.]

Michigan Agricultural Experiment Station.—Tech. Bull. 11:—How Contact Insecticides kill. (65 pp.) East Lansing, Michigan, 1911. [63.295.]

Morley, C.—The Ichneumons of Great Britain. Vol. IV., Tryphoninæ. (344 pp.) London: H. and W. Brown, *1911.* [59.57.]

Trinidad and Tobago, Board of Agriculture.—Circ. 5:—*Preliminary* Notes on some Insects affecting the Coconut Palm. (30 pp. + 3 plates.) Port of Spain, 1911. [63.27–41.]

Transvaal Dept. of Agriculture.—Tech. Bull. 1:—Bitter-pit of the Apple. (18 pp. + 5 plates.) Pretoria, 1909. [63.21.]

Brooks, F. T., and *Bartlett, A. W.*—Two Diseases (*Botrytis cinerea* and *Cytosporina ribis*) of Gooseberry Bushes. (167–185 pp. + plate.) [Reprinted from "Annales Mycologici," Vol. VIII., No. 2, *1910.*] [63.24.]

Premier Congrès International d'Entomologie, Bruxelles, 1911.—*Vol. II.*—Mémoires. (520 pp.) Brussels, 1911. [59.57; 63.27(02).]

Live Stock—

New Hampshire Agricultural Experiment Station.—Bull. 154:—The Feeding Stuffs Inspection for 1911. (8 pp.) Durham, New Hampshire, 1911. [343.53(*d*).]

Massachusetts Agricultural Experiment Station.—Bull. 139:—Inspection of Commercial Feed Stuffs. (32 pp.) Amherst, Massachusetts, 1911. [343.53(*d*).]

Wyoming Agricultural Experiment Station.—Bull. 89:—Feeding Experiments [with lambs], 1910–11. (11 pp.) Laramie, Wyoming 1911. [63.63.]

West of Scotland Agricultural College.—Bull. 57:—Report on Seven Experiments on the Feeding of Pigs conducted at the Dairy School, Kilmarnock, 1905–1910. (249–334 pp.) Glasgow, 1911. [63.64.]

Dairying and Food, General—

Maidment, E. A.—The Home Dairy and its Management. [Ninth edition.] (128 pp.) London: Simpkin, Marshall and Co., 1911. 3s. 6d. [63.70(02).]

McQueen's "Pedigree of Performances," or Dairy Herd Record Book. Part I. The Dairy Milk Record. Part II. The Ledger or "Pedigree of Performances." Leicester: J. McQueen and Co., n.d. 3s. [63.711(b).]

Hawaii Agricultural Experiment Station.—Press Bull. 31:—Brief Instructions for Farm Butter Makers. (10 pp.) Honolulu, n.d. [63.72.]

Missouri Agricultural Experiment Station.—Research Bull. 4:—Digestion Trial with Two Jersey Cows on Full Ration and on Maintenance. (22 pp.) [63.711; 612.394.] Research Bull. 5:—Maintenance Trials with Five Jersey Cows. (23–48 pp.) [63.711; 612.394.] Columbia, Missouri, 1911.

U.S. Dept. of Agriculture, Bureau of Animal Industry.—Circ. 181:—Methods and Results of Paraffining Cheese. (16 pp.) Washington, 1911. [63.734.]

U.S. Dept. of Agriculture, Bureau of Chemistry.—Bull. 143.—The Food Laws of the United Kingdom and their Administration. (42 pp.) Washington, 1911. [343.53; 614.3.]

Cornell Agricultural Experiment Station.—Bull. 303:—The Cell Content of Milk. (775–793 pp.) Ithaca, New York, 1911. [63.712.]

Veterinary Science—

U.S. Dept. of Agriculture, Bureau of Animal Industry.—Circ. 182:—The Spontaneous Oxidation of Arsenical Dipping Fluids. (8 pp.) [614.4.] Bull. 142:—Dourine of Horses: Its Cause and Suppression. (38 pp. + 5 plates.) [619.1(b).] Washington, 1911

New South Wales, Dept. of Agriculture.—Science Bull. 3:—March Flies. (10 pp.) Sydney, 1911. [59.169.]

International Commission on the Control of Bovine Tuberculosis.—A Plain Statement of Facts regarding the Disease prepared specially for Farmers and Others interested in Live Stock. (31 pp.) Ottawa, 1911. [614.5.]

Cornell Agricultural Experiment Station.—Bull. 305:—The Cause of "Apoplexy" in Winter-Fed Lambs. (35–47 pp.) Ithaca, New York, 1911. [619.3; 63.63.604.]

Forestry—

Fernow, B. E.—A Brief History of Forestry in Europe, the United States, and other Countries. (506 pp.) Toronto: University Press, 1911. [63.49.]

U.S. Dept. of Agriculture, Forest Service.—Circ. 173:—Avalanches and Forest Cover in the Northern Cascades. (12 pp. and 3 plates.) [63.49–2.] Circ. 187:—Manufacture and Utilisation of Hickory, 1911. (16 pp.) [63.491.] Bull. 86:—Windbreaks:—Their Influence and Value. (100 pp. + 20 plates.) [63.499.] Bull. 100:—The Crater National Forest; Its Resources and their Conservation. (20 pp. + 3 plates and map.) [63.49(73).] Bull. 101:—Western Yellow Pine in Arizona and New Mexico. (64 pp. + 4 plates.) [63.49(73); 63.492.] Washington, 1911.

Maw, P. T.—Complete Yield Tables for British Woodlands and the Finance of British Forestry. (108 pp.) London: Crosby Lockwood, 1912. 7s. 6d. net. [63.49:31.]

Switzerland, Inspection Fédérale des Forêts.—Statistique du Commerce des bois de la Suisse avec l'etranger, 1885–1907. (x + 170 pp.) Zürich, 1910. [63.49(494).]

Flury, Philipp.—Ertragstafeln für die Fichte und Buche der Schweiz. (75 pp.) Zürich: Fäsi and Beer, 1907. [63.49:31.]

Birds, Poultry, Bees, &c.—

Zander, E.—Handbuch der Bienenkunde in Einzeldarstellungen. I. Die Faulbrut und ihre Bekämpfung. (32 pp. + 4 plates.) Stuttgart: Eugen Ulmer, 1910. [63.8109.]

Rubow, C.—The Life of the Common Gull told in Photographs. (6 pp. + 25 plates.) London: Witherby & Co., 1911. 1*s*. 6*d*. net. [59.82.]

U.S. Dept. of Agriculture, Bureau of Chemistry.—Circ. No. 75:—Studies on Chicken Fat. I.—The Occurrence and Permanence of Lipase in the Fat of the Common Fowl (*Gallus domesticus*). II.—The Oxidation of Chicken Fat by Means of Hydrogen Peroxid. (11 pp.) Washington, 1911. [63.651.]

New South Wales, Dept. of Agriculture.—Farmers' Bull. No. 40:—Turkeys in Health and Disease. [Second edition.] (36 pp.) [63.652.] Farmers' Bull. No. 48:—Egg-Laying Competitions at Hawkesbury Agricl. College and Experiment Farm, Richmond. Nine Years' Records. (16 pp.) [63.74.] Farmers' Bull. No. 49:—The Housing and Yarding of Laying Hens. (13 pp.) [63.6:69.] Sydney, 1911.

U.S. Dept. of Agriculture, Bureau of Animal Industry.—Bull. No. 140:—Fattening Poultry. (60 pp. and plates.) [63.65(04).] Bull. 141:—The Improvement of the Farm Egg. (43 pp.) [63.65(04); 63.74.] Washington, 1911.

Alberta, Dept. of Agriculture.—Poultry Bull. No. 2:—Practical Poultry Keeping. (79 pp.) Edmonton, 1911. [63.65(04).]

Wisconsin Agricultural Experiment Station.—Bull. No. 215:—Poultry House Construction. (32 pp.) Madison, Wisconsin, 1911. [63.6:69.]

Michigan Agricultural Experiment Station.—Bull. 266:—Poultry House Construction and Yarding. (45–73 pp.) East Lansing, Michigan, 1911. [63.6:69.]

Zander, Dr. E.—Tierische Parasiten als Krankheitserreger bei der Biene. [Sonderabdruck aus der Münchener Bienenzeitung 1909. 9 Heft.] (11 pp.) [63.81.09.]

Brown, E.—Report on the Poultry Industry in Germany. (124 pp. + 15 plates.) London: National Poultry Organisation Society, 1912. 1*s*. net. [63.65(43).]

Walkey, C. E. J.—Practical Pages for Poultry Keepers. (76 pp. + 3 plates.) Taunton: E. Goodman & Son. 1*s*. [63.65(04).]

Ontario Dept. of Agriculture.—Bull. 193:—Tuberculosis of Fowls. (20 pp.) Toronto, 1911. [619.5.]

Hennicke, Carl R.—Vogelschutzbuch. (126 pp.) Stuttgart: Strecker & Schröder, 1911. 1.40 M. [59.162.]

Engineering—

Wyoming Agricultural Experiment Station.—Bull. 90:—Reclamation by Drainage. (22 pp.) Laramie, Wyoming, 1911. [63.12; 63.14.]

U.S. Dept. of Agriculture.—Farmers' Bull. 474:—The Use of Paint on the Farm. (22 pp.) Washington, 1911. [63.17; 63.49–198.]

Canada, Dept. of the Interior, Forestry Branch.—Report of Proceedings of the Fifth Annual Convention of the Western Canada Irrigation Association held at Calgary, Alta., August 8, 9, and 10, 1911. Ottawa, 1911. [63.13.]

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THE FEEDING OF FARM STOCK.

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PART II.—THE GENERAL FEEDING CHARACTERISTICS OF DIFFERENT CLASSES OF STOCK.

THE outstanding difference in the feeding characteristics of the various classes of stock lies in their relative powers of digesting and utilising the coarse, fibrous foods of the hay and straw type.

Such foodstuffs are dealt with most effectively by the ruminant animals (cattle and sheep), since they are equipped with the necessary powers of mastication and capacious digestive organs. Pigs, on the other hand, cannot deal effectively with any but the softest types of fibre, such as are met with in juicy, green food; whilst horses occupy an intermediate position in this respect. Thus the horse will masticate and digest good hay almost as successfully as cattle, but will be less successful with the harder type of fibre met with in straw.

Young animals, even cattle, are not adapted to deal with fibrous foods until their digestive powers have been well developed by feeding with easily-digested foods, of which the mother's milk is incomparably the best and safest. Even then the introduction of coarse food into a diet must be very gradual and left largely to the natural instinct of the animal. The further feeding characteristics of the various classes of stock may be conveniently discussed separately.

Young Animals.—The growth of the young animal is essentially a rapid production of nitrogenous matters (muscle, &c.)

and bone. Hence the prime consideration in making up the food ration must be to ensure a sufficiently liberal supply of digestible albuminoids (see *Journal*, Feb., 1911, p. 901) and of the bone-forming mineral ingredients (lime and phosphates). Further, it is desirable that any food given with the milk, which will form the basis of the ration during the early months of the young animal's life, shall be, like milk, comparatively rich in albuminoids and oil, and easily digested. No single foodstuff fulfils these requirements more satisfactorily than linseed.

As the animal grows the special requirement for albuminoids decreases steadily in proportion to its total food requirements, and the ration may be correspondingly adjusted to be poorer in albuminoids and richer in carbohydrates. In the case of young stock growing up under natural conditions this adjustment is effected spontaneously. For example, calves or foals running on grass with their dams make the adjustment by steadily increasing the amount of grass eaten in proportion to milk consumed. Where animals are reared under more artificial conditions, the adjustment must be made very gradually. It will always be safer to err on the side of liberality in the supply of albuminoids to growing animals.

The *quantity* of food required by the young animal increases, of course, with the growth of the animal, but not at the same rate. On the contrary, the amount of growth produced per unit weight of food consumed steadily diminishes as growth progresses, until at last the point is reached when the animal attains its full growth, after which no further gain in weight takes place unless fattening conditions are resorted to.

A further matter that demands attention in the feeding of growing animals is the supply of mineral ingredients in the food, and especially of lime and phosphates, since these enter so largely into the composition of the bones. Cases of bone trouble in young stock, especially pigs, have frequently been traced to deficiencies in this respect.

Suitable facilities must be provided for exercise in the open air, in order to ensure full development of the muscles and bones, and general soundness of constitution.

In all matters relating to the treatment of young animals

their welfare and comfort should be objects of special care, all harshness or irregularity being avoided.

To sum up, it is of fundamental importance in the rearing of young stock that all the conditions of feeding, exercise, treatment and environment shall be such as to favour natural development. So far as the food is concerned, this should be liberal in quantity, well supplied with albuminoids, oil and useful mineral matters, of the best quality, and thoroughly suitable in every way.

Many feeders modify the treatment of young stock according to the purpose for which they are subsequently intended, a somewhat heavier and richer ration being given to those that are subsequently to be fattened when full-grown than to those that are to form the future breeding stock. In the former case the qualities desired are size and early maturity, whereas in the latter other qualities are desired which a tendency to fleshiness would in most cases be likely to impair, *e.g.*, the milk-yielding propensities of heifers.

Fattening Young Stock.—The fattening of young animals affords a somewhat different case from the simple rearing of the young animal to maturity. In the former case it is necessary to secure a production of fatty tissue alongside the normal growth of the animal. This is effected by a more liberal feeding and more restricted exercise.

The fattening increase is largely composed of fat, so that the extra food need not be specially rich in albuminoids. In this respect it should be intermediate in character between that supplied for purposes of growth solely and that given for fattening purposes to a full-grown animal of the same class. In other respects the conditions outlined above should be closely observed.

Fattening Adult Animals.—The fattening of full-grown animals is mainly a conversion of food into body-fat, very little albuminoid matter being contained in the fattening increase. The additional food required in excess of the maintenance ration (*i.e.*, the ration required to keep the animals in "store" condition) may therefore consist largely of digestible oil, carbohydrates, and fibre. For reasons already explained (p. 906), however, it is not desirable that the preponderance of carbohydrates, &c., should be greater than is represented

by an albuminoid ratio of 1 : 10. A wider ratio than this can only be justified by the necessity to use up supplies of food-stuffs that have very wide albuminoid ratios (*e.g.*, straw and roots). It will then mean that a greater weight of food must be consumed by the animal in order to get the necessary minimum supply of albuminoids.

If cheap supplies of food rich in albuminoids are available, the albuminoid ratio may be considerably narrowed, but it is not advisable, and rarely practicable, to increase the proportion of albuminoids beyond that which corresponds to an albuminoid ratio of 1 : 4.

Animals that are in poor, lean condition at the outset of fattening should receive a more liberal supply of albuminoids for a few weeks than those which start in fair condition, in order to ensure that the fleshy tissues shall be fully developed and made capable of storing up large quantities of fat.

In deciding what concentrated foods shall be included in the ration, any influence that they are known to exercise upon the quality of the carcass should be kept in mind. Thus, maize, rice-meal, oats, and linseed cake have a softening tendency upon the fat, whilst cotton cakes, peas and beans have the opposite effect.

In order to obtain the best results in fattening, it is necessary that the activities of the animal shall be confined as far as possible to the consumption of food. It is necessary, therefore, to restrict greatly the facilities for exercise. The provision of abundant litter will also contribute to the same end, by inducing the animal to lie down more frequently, as will also all other measures that promote its comfort.

Working Animals.—The requirements of the working animal, so far as the composition of its ration is concerned, are in the main similar to those of the fattening animal, since, under normal conditions, muscular energy is chiefly generated from the carbohydrates and oils of the food, and least of all from the albuminoids. It would thus appear that the ration in the case of full-grown animals may have an albuminoid ratio as wide as 1 : 8 or even 1 : 10. Much depends upon the character of the work to be performed. If great calls are made for a rapid or heavy output of energy, as in the case of racehorses, practical experience shows that it is not advisable to cut down the supply of albuminoids to such an extent as

the above-named ratios imply. Moreover, in such cases the bulk of the food must be given in concentrated, easily digested form, in order that the nutriment contained in it may be quickly placed at the service of the animal, without undue wastage or strain in the processes of digestion.

It must further be borne in mind that the amount of work which an animal can perform is not determined simply by the food-supply. It depends also upon the state of efficiency of the mechanism by which the work is performed (*i.e.*, the muscles). An animal with feebly-developed muscles (*i.e.*, in poor condition) will be unable to perform as much work as when its muscles are fully developed, even although it receive the same ration. The development of the muscles is induced by regular exercise, and requires for its support an increased supply of albuminoids in the food.

For these and other reasons it is advisable that the ration of animals that are called upon for heavy or rapid exertions shall be proportionately somewhat richer in albuminoids than the rations of animals at light or slow work or at rest.

Milk-yielding Animals.—The case of the milk-yielding animal differs essentially from that of the fattening animal or growing animal, in that the special product manufactured by the animal is removed entirely from the body.

From the table on p. 901 it will be seen that the milk of all classes of farm animals contains considerable proportions of albuminoids, fats, and carbohydrates. These materials are manufactured by the animal from ingredients of the body, which must obviously be replaced by feeding if the "condition" of the animal is to be maintained.

The production of milk-fat and milk-sugar can be sustained by supplying oil and carbohydrates in the food, but only albuminoids will serve for the production of the albuminoids of the milk.*

It must further be borne in mind that the milk also contains appreciable quantities of various mineral ingredients, notably phosphates, potash and lime, so that the ration must also make good the removal of these ingredients from the body.

From the foregoing considerations it follows that the milk-

* The question as to how far the functions of albuminoids in the food can be fulfilled by "amides" is still under investigation.

yielding animal requires, in addition to the ration which would "maintain" it were there no secretion of milk, a supply of food which must be greater the more abundant the milk-flow, and which must include a liberal proportion of digestible albuminoids.

The ration of the milk-producing animal may thus be regarded as made up of two portions—a maintenance portion which will vary according to the size of the animal, and a milk-producing portion which will vary according to the milk-yield. Up to a certain point, which varies greatly in different individuals of the same class, any food placed at the disposal of the animal beyond the minimum necessary for maintenance is utilised very economically for purposes of milk-production. When the food-supply is steadily increased, however, the point referred to is reached sooner or later, beyond which there is an increasing tendency for additional food to promote fattening rather than to increase the flow of milk. Eventually the limit is arrived at beyond which no higher yield of milk can be obtained by increasing the food-supply. In these higher stages of milk-production the cost of production steadily increases and must be the determining factor in deciding what is the most profitable yield to aim at.

The percentage composition of the milk yielded by a particular animal is largely independent of the nature of the food supplied. Provided that the ration is such that it maintains the milk-yield and general "condition" of the animal, the composition of the milk can in general be but little affected by changes in the nature of the foods included in the ration. Even in the case of under-feeding, the composition of the milk is, as a rule, but little affected until the condition of the animal has been very seriously reduced. Little reliance can be placed, therefore, upon the claims advanced on behalf of certain foods, that they exercise a specific influence upon the composition of the milk. The commonest of such foods are malt coombs, palm-nut cake, and cocoanut cake—all of which are said to exercise a specific beneficial effect upon the quality of the milk. There is good evidence that this is true *to a limited extent* of the two cakes mentioned.

A further exception ought perhaps to be made of the case of very watery foods, such as turnips or brewers' grains,

in view of the widespread opinion of farmers and cowkeepers that the quality of cow's milk can be appreciably lowered by the use of such foods. This view has received as yet but little support from the experimental investigation of the subject, which, however, needs to be considerably amplified before the question can be regarded as definitely settled. Long-continued consumption of excessively watery food will probably lead ultimately to a general weakening of the organs of the body and thereby cause a secretion of more watery milk. As a rule, however, the amount of water supplied in the food can vary greatly without diluting the milk. Certainly under ordinary conditions the quantity of milk secreted is quite independent of the amount of water consumed by the animal, the excess, if any, being mainly excreted in the urine and through the skin.

Although the nature of the food has, in general, little effect upon the percentage composition of the milk, it may have an appreciable effect upon the quality of the milk in other ways, *e.g.*, flavour, hardness of butter-fat, and so forth. This fact must be kept in mind in selecting foodstuffs for the ration of cows.

The secretion of milk is largely controlled by the nervous system of the animal, and any disturbance of this organisation may have a very marked influence upon the yield and composition of the milk, the magnitude of the effects produced varying greatly in different individuals. Such disturbances may arise from discomfort, harsh treatment, œstrum, or inclement weather.

ROPY MILK.

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OF all the abnormal changes which sometimes take place in milk, one of the most common and persistent is what is called "ropy" or "slimy" milk. Such milk, when poured from a jug, has a rope-like form. A spoon or wire dipped into the milk and then taken out draws after it thread-like strands sometimes over a yard in length. Such an abnormal

appearance naturally alarms the consumer, while the persistence of the trouble frequently causes great loss to the milk vendor.

Cause of Ropiness.—The appearance of ropiness in the mixed milk of a herd several hours after milking, is due to the growth of bacteria, which, as a general rule, gain access to the milk after it has left the udder of the cow, though in a few instances they may exist in the udder before milking.

Garget Milk.—Ropiness is sometimes observed in milk from individual cows, notably in cases of inflammation of the udder. In such cases the cause may be either bacterial or non-bacterial. If the ropiness does not increase as the milk is kept and cannot be propagated by transference into another sample of fresh milk, it is probably due to the presence of fibrin and white corpuscles from the blood, which form masses of slimy material in the milk. Such milk is known as garget milk, and it is unfortunate that the term "ropy" should be applied to it, since this use of the word gives rise to the common impression that all ropy milk is unwholesome.

Although garget milk may not cause other milk to become ropy, organisms are present in the milk which may lead to infection being spread from one cow to another by the hands of the milker. For this reason prompt attention should be given to all cows suffering from this disease, and all sources of infection avoided.

An organism (*Bacillus Guillebeau*) which makes milk ropy has also been found in Switzerland in the inflamed udders of cows.

BACTERIA CAUSING ROPINESS.

Classification.—The various organisms producing ropiness are so numerous that it is necessary to devise some form of classification before giving details as to their origin, bacteriological features, means of identification, and methods of eradication.

Probably the most fundamental and easily recognised characteristic which can be used for the purpose of classifying pure cultures of the different organisms depends on the property which some possess of dissolving the casein or curd of the milk, a thick, honey-like solution being produced when the organism is grown for some time in sterilised milk. (See Reference 29.)

To this group, which we may call Group I., belong organisms which, as a rule, require a large amount of oxygen, or, in other

words, are strongly aerobic, growing mostly on the surface of the milk or in the cream layer. None of these organisms produce much acid, and many produce no acid, while others produce an alkaline reaction in the milk.

To another group (Group II.) belong organisms which do not dissolve the casein, but precipitate it by means of the acid they produce. The casein in this state helps to thicken the slimy substance produced, and is not afterwards dissolved. The organisms of this group are able to grow much better without air than the other type. They therefore grow through the entire mass of the milk or whey.

Certain ordinary lactic bacteria sometimes acquire the property of forming slime, and must therefore be included in this group. They are sometimes the cause of sliminess in "starters" used in creameries and cheese factories. In the manufacture of Edam cheese a ropy starter, called "lange wei," is sometimes used in Holland. It is very persistent when introduced into a dairy, and makes cheese of very uniform quality.

Adametz (1) has suggested that the ropy milk organisms may be classified according to the nature of the slime-producing substance. In this method of classification the first and largest group (Group 1) consists of those organisms which produce slimy milk as a result of the swelling of the outside layers of the cell membrane, which, becoming sometimes thicker than the diameter of the organism, makes a sticky capsule, which adheres to solid substances and also causes the organisms to stick together.

A study of the characters given in the unit column of the properties of the organisms (see table in appendix) shows that nearly all the organisms in Group I. come under this head, these being harmless from a dietetic point of view. The ropy cell wall has a composition resembling cellulose, and has in some instances been identified as dextrin.

An exception to the harmless nature of these organisms is *Bacillus Guillebeau* (c), which also owes its slime-producing properties to a swollen capsule, but must be classed separately because it comes from diseased udders, and must be regarded as pathogenic or disease-producing.

The members of the second group (Group 2) owe their ropiness to the production of a slimy protein substance, which is also harmless. The chief organism in this group is the whey coccus, which plays an important part in the making of some varieties of Edam cheese.

The third group (Group 3) which Adametz suggests, contains only one known member (*Bacillus viscosus I.*, van Laer). This organism owes its ropiness to a nitrogen-containing substance, which, however, is not a protein.

In some other cases, as with the organisms more generally known as lactic ferments, and in cultures in which ropiness may not always be observed, the cause is more probably due to the enormous number of bacteria developed in the medium than to any specific slimy material produced.

Not Injurious to Health.—With the exception mentioned above, ropy milk caused by bacteria is not injurious to health,

:ertain kinds of ropy milk being much prized in some coun-ries as an article of diet, but its mechanical condition and ıppearance are so abnormal that it must be quite an acquired aste. The writer has given ropy whey (made from *Bacillus ebenis*) to pigs, and found they apparently preferred it to)rdinary whey.

History of Investigations.—In 1847 Girardin investigated ropy nilk from the chemical point of view, and tried to find the cause n the defective composition of the fodder. Lister (2) was, however, he first to infect milk artificially with the disease.

Schmidt-Mülheim was the first to investigate ropy milk from a acteriological point of view; he published his results in 1883 (3). Ie found it to be caused by a round organism (*Micrococcus viscosus*), bout $\frac{1}{25000}$ of an inch in diameter, which was capable of movement, nd occurred frequently in chains. Ropiness is caused by this rganism in from 18 to 24 hours.

Since the discovery of this organism many others have been isolated nd named (see list in appendix A). They vary very much in size nd shape, some being large round forms, others smaller. Large nd small rod-shaped organisms may also be the cause of this milk ault.

DISTRIBUTION AND SOURCE OF ROPY MILK ORGANISMS.

These organisms are described in the following paragraphs from ıe practical point of view, with special reference to their source ıd distribution.

GROUP I.

Bacillus lactis viscosus, Adametz.

Probably the most important organism from the dairy farmer's oint of view is one discovered by Adametz, which seems to be very idely distributed, and has been very fully investigated by him in ienna, by Ward (4) in America, by Barthel (5) in Stockholm, and as also investigated in 1911 by Mr. Wilfrid Sadler and the writer, who und it to be the cause of a very persistent outbreak of the trouble Notts.

Adametz first found it present in the Peter's Brook water near ienna, and also in the effluent from the Liesinger Brewery. In the rmer case 100 to 200, and in the latter 1,000 of these organisms ere present per cubic centimetre.*

Ward states that the minimum temperature for the growth of this ganism is 46° F. (8° C.), and the maximum temperature is 104° F. 0° C.). He has come across a case of ropiness caused by this ıcillus in milk kept at 45° to 50° F., *i.e.*, at the temperature of oled milk. Freezing for 24 hours does not destroy the vitality the organism.

Ropy Cream.—When milk is "set" for 30 to 40 hours after oculating with *Bacillus lactis viscosus*, the cream only goes ropy.

* These terminations were made by inoculating sterile tubes of milk with **uations of the water.**

The skim milk is never slimy. Lactic acid bacteria are formed in it which prevent the development of this ropy milk organism.

Ropy cream can be used for butter-making, and only when very ropy has the butter a rather soft and smeary appearance. Butter made from cream even if only slightly ropy decomposes very quickly. In an experiment carried out by Adametz the milk of certain cows was inoculated with this organism, and the cream afterwards made into butter; this butter went rancid in 8 to 10 days, while butter used as control was quite good after three weeks. "When the butter from ropy milk was cut through it showed little holes and looked like soft cheese."

It is thus seen that *B. lactis viscosus*, unlike the acid-producing ropy milk organisms of Group II., does not tend to increase keeping qualities, but, on the contrary, probably favours decomposition.

Ward found the *B. lactis viscosus* in a wooden tank of ice water in which the "40 quart cans" of milk stood every night. The particles of damp sawdust on the floor, which were introduced along with the ice, also brought about a slight viscosity when added to sterile milk. Ward states that dust infected the milk in the creamery.

One dealer discontinued the cooling of the milk, thus giving the ordinary lactic organisms a chance to crowd out the other less common organisms.

C. H. Eckles, of Iowa, who isolated *B. lactis viscosus* from twelve samples of ropy milk and from the air of a stable and a creamery, states:—"The occurrence of ropy milk shows that one condition of good handling has been observed—that of cooling."

Chr. Barthel investigated two cases of ropy milk in Stockholm, and he attributed the cause to *B. lactis viscosus*. In one case the organism was thought to have been in some hay which was used for littering, but this was not proved.

Micrococcus Freudenreichii, Guillebeau.

Freudenreich states that the chief cause of ropy milk in Switzerland is a large, round coccus, with a diameter of $\frac{1}{12500}$ of an inch. It is *non-motile*, and, unlike *B. lactis viscosus*, liquefies gelatine. In sterilised milk it thrives best at 68° F. This organism grows with such speed and vigour that even unsterilised milk when inoculated with it exhibits a noticeable change in five hours.

Bacterium Hessii, Guillebeau.

Guillebeau isolated an organism from the milk of a cow from a mountain pasture in Switzerland. Although it makes cream slightly stringy it is not probable that it is of practical importance as the sliminess disappears as soon as a little acid is produced.

Straw Coccus.

A coccus which makes milk ropy was discovered by Hohl in samples taken from the interior of bundles of pressed straw which had been sent from the French provinces to Switzerland.

It is interesting as an instance of a possible source of the trouble, but has not at present been proved to be the cause of an outbreak of ropy milk.

GROUP II.

In addition to the pathogenic organism mentioned above are many other types of lactic ferments. B. lactis aërogenes has been stated by O. Emmerling to be capable of making milk ropy, although this organism is more generally known as a type of lactic ferment closely resembling *B. coli,* and, like it, is dreaded by the cheese-maker as causing "blown" cheese owing to its power of producing gas.

Other lactic bacteria, as Weigmann (30) has shown, can become slime-producing.

Bacillus lebenis.

The writer has found, for example, that *B. lebenis* grown in whey constantly makes it ropy.

So much acid is produced that this ropy whey will keep for several weeks without undergoing any other changes, although exposed to inoculation by an abundance of other bacteria.

Ordinary whey inoculated with this organism and kept at a suitable temperature in a cheese vat, was afterwards bottled, and though the ropiness decreased in the course of a few weeks, the material was kept for two years without going bad.

Lange wei.

The first experiments with this "starter" were made in the 'fifties by a farmer at Assendelft in Holland, but it was not generally used till 1887, when Boekel strongly recommended its use. Since that time much work has been done on the subject, and Weigmann has isolated a streptococcus from the mixed culture used in practice; but probably this organism is associated with others in the *Lange wei,* which increases its ropy producing properties.

Weigmann has isolated a similar organism from the commercial products known as Taettemaelk (thick milk) of Norway and Filmjölk (stringy milk) of Finland and Sweden, which are prepared as articles of diet. There is a very widespread belief that these beverages are prepared from the leaves of the Common Butterwort (*Pinguicula vulgaris*); but although ropy milk is said to have been produced from the leaves of this plant, Orla-Sopp (31), has shown that this plant does not produce typical Taette. The writer also has not succeeded in attempts to produce ropy milk in experiments with a few plants of Butterwort from Derbyshire, and it is quite probable that the leaves of this plant are not always infested with the organism. These forms of ropy milk are produced by the combined action of several kinds of organisms growing in a mutual relationship which is called "Symbiotic." The milk is not only made ropy, but has also a certain degree of sourness and considerable keeping properties.

Outbreaks of Ropy Milk in the British Isles.—Most of the above organisms have been investigated on the Continent and in America, but there is reason to believe that ropiness is of no less frequent occurrence in the British Isles.

Almost every year for the past sixteen years reports of outbreaks have been sent to the Midland Agricultural and Dairy College. Advice on the lines indicated below has been given, with the result that the trouble has been quickly stopped; but in very few cases has the organism been identified and traced to its source.

During the year 1911 reports reached the writer of outbreaks of ropy milk in the North of England, also in Scotland and in Ireland.

A typical and very persistent outbreak occurred near Nottingham in May and June, 1911, which caused great loss to the farmer whose milk was affected. The case was investigated by Mr. Wilfrid Sadler and the writer.

On June 7th a visit was made to the farm, and the following samples were taken in sterile bottles:—(*a*) The milk from individual cows, and the milk of the herd before and after straining, &c.; (*b*) the water which the cows drank, and the water used for washing the churns, pails, &c.; (*c*) a dilute solution of soda from a wooden tub in which the milk churns and pails were washed, the solution not having been effectively washed out after the cleansing operation; (*d*) the washings of a cloth which was used for drying the churns after scalding; (*e*) rinsings of the milk-pails immediately before use for milking; (*f*) water from ponds in the fields into which the cows were turned—it was found that the cows waded in the ponds, getting the dirty water on their udders; (*g*) the herbage of the fields and the straw in the cow-byre; and (*h*) plates of gelatine were exposed in the fields, cow-byres, &c., and the organisms which subsequenty appeared and which came from the air were examined as to their action on milk.

The discontinuance of the method of cleaning was at once advised. A galvanised iron vessel was substituted for the wooden tub, and this was scalded out after use. It was recommended that the use of a cloth be discontinued. The ponds were fenced round so that the cows could no longer wade in them, and the cows were later changed to another pasture. After these precautions had been taken the trouble quickly ceased.

A bacteriological examination of the samples taken proved that a ropy milk organism was present in large numbers in the

alkaline water in the wooden tub. The cloth used for wiping the churns, and the churns and pails which had been washed in the wooden tub were also infected with this organism.

There is no doubt that the immediate source of infection was the wooden tub, the water in which had probably been made specially favourable for this organism by the use of the dilute soda.

The solution of the problem as to the natural habitat of the organism was indicated by the fact that it was discovered in small numbers in the drinking water standing in a trough under a pump in the field where the cows were turned out when the trouble first arose.

The organism was not found in the other samples of water examined, which included the water from the pump supplying the wooden tub. It would be quite possible for a few organisms to have been carried from this drinking trough to the cow-byre on the udders or on the flanks of the cows, and then to have infected the milk pails. The outbreak was subsequently greatly aggravated by the growth of the organisms in the akaline water of the wooden tub.

The ropy milk organism was not in this case found in the air or in the straw of the cow-byre or on the herbage of the field.

On examining pure cultures of the organism it was found to be identical with that discovered by Adametz, and named by him *B. lactis viscosus*.

The photographs show the appearance of the organism under the microscope (multiplied 1,500 diameters), the slide being made from a young culture on Agar agar.

The other characters all corresponded with the original organism isolated by Adametz, which, as mentioned above, has been found widely distributed in water.

In another case which the writer investigated, the trouble occurred every spring when the cows were turned into a particular pasture, but the source of the organism was not discovered.

SUMMARY.

Causes of Ropiness.—1. Ropiness in the mixed milk of a dairy herd, which increases on allowing the milk to stand, is due to the growth of bacteria.

2. Milk which is ropy at the time of milking may or may not be due to the growth of bacteria; but though it may not cause an outbreak of this trouble, it should not be used for food and should be regarded as more harmful than ropy milk proper.

3. In cases of garget or inflamed udders, special care should be taken against the infection of other cows by the hands of milkers, &c.

4. With the exceptions mentioned in 2 and 3, ropy milk is wholesome and does not endanger public health.

5. The organism may come from water used for washing dairy utensils, &c., or from water in which cows have been standing, or which has otherwise been splashed on their flanks or udders.

6. The trouble may also come from dust and straw, as well as from the *butterwort* and probably other plants.

7. Some forms of ropy milk organisms grow at the temperature of cooled milk.

8. Wooden vessels tend to encourage the persistence of the trouble, as do also dilute solutions of soda if these are not freshly made from boiling water.

9. Most of the organisms require air for their growth, and the cream layer, therefore, tends to go ropy before the lower layers of the milk.

10. Some forms of ropy cream make butter which quickly goes rancid; but on the other hand other organisms are prized as "starters" in the making of Edam cheese.

Tests to be used in cases of Ropiness in Milk.—1. It should first be ascertained whether the outbreak is caused by bacteria by adding a few drops of the affected milk to some sound new milk in a clean glass. This glass should then be placed in a warm room and kept loosely covered to prevent dust getting in. The time taken for ropiness to appear should be noted.

2. The cows should be examined, and samples taken in clean glasses from the milk of individual cows and from the mixed milk after straining, cooling, &c. The time taken in each case for ropiness to appear should be noted.

3. To a glass of clean fresh milk from another source should be added some of the water used for washing the churns and pails and to another glass some of the water

which the cows drink. A glass of this milk should also be left exposed in the dairy.

The results of these experiments may indicate the source of the trouble, but it is as well to adopt the following practical measures:—

Prevention of Ropy Milk.—1. As water is a frequent source of the trouble, special care should be taken in washing the milking pails, strainer cloth, &c., after each milking. When thoroughly clean these should be well scalded and *should not again be rinsed with cold water.* It is well to scald the pails, &c., shortly before milking.

2. Great care should be taken to see that no water is splashed into the milk in the process of cooling, &c.

3. As dust is sometimes a carrier of these germs, the pails, &c., after washing should be kept upside down, and the milk when it is in the pails should be kept covered as much as possible.

4. The rooms where the milk is kept should be well cleaned. Wooden, cement, or stone floors may be cleaned with a mixture of five parts sulphuric acid to ninety-five parts of water, but care should be taken that this does not get on the clothes of the person using it.

5. Wooden vessels should not be used, as they may persistently retain the ropy milk organisms. It is not well even to use wooden troughs for washing milking vessels, but when they are used special care should be taken to clean them on all such occasions.

6. Dilute solutions of washing soda favour the growth of the organism, and it would be better to use sodium hypochlorite or some other cleanser and disinfectant in cases of an outbreak of ropy milk.

7. Straw has been shown to hold ropy milk organisms, and the custom of wiping the udders of the cows with a wisp of straw before milking is very bad. After washing their hands for milking, milkers should not handle straw or fodder, nor should any such material be brought into the cow-byre just before or during milking.

8. The cows should be kept clean and the udders should be washed and disinfected with a very dilute solution of formalin, especially if the cows have been standing in dirty water or wading through mud.

9. Ponds and streams should be fenced off so that the cows cannot wade in them.

10. On the first indication of an outbreak of ropy milk the cows should, if possible, at once be turned into another pasture.

APPENDIX A.

A COMPARISON OF THE PROPERTIES OF THE ROPY MILK ORGANISMS.

In order to compare the principal morphological and physiological features of the chief organisms at present discovered, which give rise to ropy milk, the writer has adopted a modification of the numerical system used by the Society of American Bacteriologists. (28.)

A short description of other striking characteristics of each organism is also given, and in Appendix B will be found references to papers and books on the subject, in which each organism is more fully described.

The organisms are divided into two groups as described on page 992.

Group I.—Group I. consists of those organisms which in pure cultures of milk possess the property of dissolving the casein, making a thick, honey-like solution in old cultures. These organisms tend to produce an alkaline reaction in the milk, though some produce a little acid. They are for the most part aerobic.

Group II.—Group II. consists of those organisms which do not dissolve the casein, but which, by means of the acid they produce, precipitate it. The quantity of acid produced in milk is in some cases very large. They are for the most part facultatively anaerobic.

Name of Organism.	Described by.	Reference No.	
	Group I.		
Bacillus lactis viscosus	Adametz	(1)	5211·122213
Bacillus viscosus	Adametz	(6)	6211·111267
Micrococcus Freudenreichii ...	Guillebeau	(7)	1221·111211
Bacterium Hessii	Guillebeau	(8)	6216·111040
Carphococcus pituitoparus ..	Hohl	(9)	2220·122013
Diplococcus viscosus	Y. Sato	(26)	2221·121214
Coccus lactis viscosi	Grubler	(10)	2200·111015
Bacillus viscosus I.	van Laer	(11)	6203·122315
Actinobacter du lait visqueux ...	E. Duclaux	(12)	6221·0001
Actinobacter polymorphus ..	E. Duclaux	(13)	6001·0001
Potato bacillus	F. Heuppe	(14)	1·
Bacillus mesentericus vulgatus ..	Flugge	(15)	5111·216215
Bacterium visco-fucatum... ...	F. C. Harrison and B. Barlow	(27)	5221·114255
	Group II.		
Micrococcus viscosus	Schmidt-Mülheim	(3)	3012·000005
Micrococcus mucilaginosus ...	S. v. Ratz	(17)	8201·111026
Micrococcus viscosus lactis ...	Conn	(18)	3000·101000
Bacterium Guntheri	R. Burri	(19)	6220·221200
Bacillus lactis pituitosi	Loeffler	(20)	7121·225007
Bacillus Guillebeau (c)	E. von Freudenreich	(21)	5001·021148
Bacterium lactis aerogenes ...	Emmerling	(22)	5221·0211
Bacillus lebenis		(23)	
Streptococcus hollandicus	H. Weigmann	(24)	3002·020003
Streptococcus lacticus...	H. Weigmann	(25)	

The characters which have been selected for comparison are indicated by group numbers as follows:—

Numerical System Selected for Comparing the Characters of Ropy Milk Organisms.

Group Number.	
1000	Large coccus about 2μ in diameter.
2000	Small ,, ,, 1μ ,,
3000	Streptococcus.
5000	Short rod
6000	Long ,, $1\mu \times 2\mu$.
7000	Slightly curved rod.
8000	Oval cocci $1{\cdot}2\mu \times 2{\cdot}1\mu$.
100	Endospores produced.
200	,, not produced.
10	Motile.
20	Non-motile.
1	Ropiness due to swollen capsule.
2	,, ,, slimy protein substance.
3	,, ,, *non-protein nitrogenous body.*
4	,, ,, *enormous number of organisms.*
6	No capsule produced.
0·1	Aerobic.
0·2	Facultatively anaerobic.
0·01	Gelatine liquefied.
0·02	,, not liquefied.
0·001	,, colonies white and shining.
0·002	,, ,, small and opalescent to transmitted light.
0·004	*Produces a wide range of colours—blue, &c.*
0·005	White colonies, brownish to transmitted light.
0·006	Liquefying colonies, like hay bacillus.
0·0001	Gas produced in milk.
0·0002	*No gas produced in milk.*
0·0003	Produces a yellowish-green curd on surface of milk.
0·00001	Ropiness strong and permanent in milk.
0·00002	,, weak, but ,, ,,
0·00004	,, *weak; passes off in time.*
0·00005	,, permanent grey or green-blue produced in *forty hours.*
0·00006	All casein dissolved; liquid, yellow, and slimy.
0·000001	Makes milk ropy at room temperature under 5 hours.
0·000003	,, ,, ,, ,, ,, ,, 15 ,,
0·000004	,, ,, ,, ,, ,, ,, 20 ,,
0·000005	,, ,, ,, ,, ,, ,, 25 ,,
0·000006	,, ,, ,, ,, ,, ,, 36 ,,
0·000007	,, ,, ,, ,, moderately rapidly (2 days).
0·000008	,, ,, ,, ,, slowly.

Example of Method of Using the Numerical System.

Bacillus lactis viscosus**, Adametz, 5211·122213.**

5000	The organism is a short rod.
200	Endospores are not produced.
10	It is motile.
1	Ropiness is due to a swollen capsule.
0·1	The organism is aerobic.
0·02	Gelatine is *not* liquefied.
0·002	Colonies on gelatine are small and opalescent to transmitted light.
0·0002	No gas is produced in milk.*
0·00001	Ropiness is strong and permanent in milk.
0·000003	Milk is made ropy in less than 15 hours at room temperature.

* Adametz states that a little gas is produced, and that bubbles were seen on shaking a tube culture in milk. There is, however, no evidence of gas being produced in Durham tubes.

Additional Characters.—In milk the capsule is very marked, and is sometimes as thick as the length of the organism; but in most cases is only one-third the thickness of the rod.

Ward has noted a great difference in the size of individual organisms when grown in bouillon culture, and also that in this case the two ends of the rods are more darkly stained (bipolar staining).

The bacilli are readily stained by aniline dyes, also by Gram's stain and by hæmotoxylin.

The method of Gabbi (26) and Welche's glacial acetic acid method are recommended for the staining of the capsule.

Large involution forms are frequently observed in old cultures; they often resemble yeasts in size and shape.

COMPARISON OF THE CHARACTERS OF VARIOUS ROPY MILK ORGANISMS.

It will be seen on looking up the thousands column that ropy milk organisms differ very much in size and shape.

There is, however, a considerable tendency to variation between individual organisms of the same kind, this being very marked in bouillon cultures. Many of the organisms produce involution forms, so that very fresh cultures should always be prepared before making slides for the purpose of identification.

The tendency to form chains and the length of the rods are very variable.

From the hundreds column it will be seen that spore formation is as a rule absent. Special care must be taken in examining *Bacillus viscosus*, which, according to Conn, gives the appearance of spores with double staining.

Although different members of the group vary greatly as regards motility (see ten's column), the character is not a very reliable one for the purpose of identification. If, however, fresh cultures on agar are made daily for a week and kept at an optimum temperature motility should be observed in the seventh culture, if the organism possesses the property. The culture should be examined when *8 to 16 hours' old.*

The cause of ropiness (see unit column) is a fundamental difference, which, as mentioned above, can be used for purposes of classification, but it does not serve to distinguish between the many organisms which owe their ropiness to a swollen capsule.

It is evident from the first decimal place that most of these organisms are more or less aerobic; the organisms in Group I., being "obligate aerobes," with one or two exceptions.

The liquefaction of gelatine (second place of decimals) is a valuable property for the purposes of identification, but in some cases the liquefaction takes place very slowly; *Micrococcus mucilaginōsus* only liquefies gelatine in three weeks.

The variation in this respect between the individual members of Group I. indicates very fundamental differences in the chemical action of these organisms on the nitrogenous constituents of milk, and work in this direction would probably bring into greater prominence the differences between the organisms of this group.

The numerical system fails to do justice to the method of distin-

guishing between members of this group by the appearance of colonies on gelatine (third place of decimals). Descriptions of the growth on various media are given in most of the original papers, and in some of the text-books mentioned, and, better still, pure cultures of many of the organisms can be obtained for comparison in this respect.

As regards gas production (fourth place of decimals) the strongly aerobic nature of the organisms of Group I. makes it difficult to obtain growth in a closed tube, but in some cases considerable quantities of gas are produced.

The permanence of ropiness (fifth place of decimals) must necessarily be studied in pure cultures. If other organisms are present variable results may be obtained.

The time taken to make milk ropy (sixth place of decimals) is a factor of the greatest importance from a practical point of view. The writer has excluded all those organisms from the list which take longer than three days to produce this condition, as these would be of no practical importance to the milk vendor.

The staining quality of these organisms does not offer a good means of differentiation, as they all stain fairly well by ordinary methods.

APPENDIX B.

References.

Author.	Publication	Reference.
Adametz, L.	*Landw. Jahrb.*, Vol. XX., 1891, pp. 185-206	(1)
,, ...	*Centralbl. f. Bakt. II.*, Vol. VI., 1900, p. 406.	(6)
Barthel, Chr.	*Centralbl. f. Bakt.*, Bd. 28, 1910, pp. 614-617	(5)
Beijerinck, M. W. ...	*Bot. Ztg.*, Bd. 49, 1891, p. 704	(25)
Burri, R.	*Schweizer landw. Centralbl.*, 1903.	(19)
,, ...	*Centralbl. f. Bakt. II.*, Vol. XII, p. 192 ..	(19)
,, ...	,, ,, ,, p. 371 ...	(19)
Conn, H. W.	*Classification of Dairy Bacteria.* Report Storr's Ag. Expt. Station, 1899.	(6)
Duclaux, E.	*Ann. de l'Inst. Agron.*, T. VIII., 1882 ..	(3) (12)
,, ...	*Traité de microbiologie*, 1883	(13)
,, ...	*Principes de laiterie*, 1893	(12 & 13)
Flugge	*Mikroorganismen*, 1896, p. 198	(15)
,,	,, p. 359	(20b)
Freudenreich, E. von ..	*Ann. de microgr.*, Vol. II., 1889, p. 353 .	(21)
Gabbi	*Centralbl. f. Bakt.*, Vol V., p. 505	(26)
Gruber, Th.	*Centralbl. f. Bakt. II.*, Vol. IX., 1902, p. 785	(10)
Guillebeau, A.	*Landw. Jahr. der Schweiz*, Vol. V., 1891, p. 135.	(7)
Harrison, F. C., and Barlow, B.	*Centralbl. f. Bakt. II.*, Vol. XV., 1905, p. 517.	(27)
Hohl, J.	*Centralbl. f. Bakt. II.*, Vol. IX, p. 338 .	(9)
Hueppe, F.	*Mitt. Kais. Ges.-Amt.*, Vol II., 1884, p. 309	(14)
	Dtsch. mediz. Wochenschr., Vol. X., 1884, p. 777.	(14)
Laer, van	*Centralbl. f. Bakt.*, Vol. IX., 1891, p. 700.	(11)
Lafar, F.	*Handb. der Tech. Mykol.*, No. XII., 1906, p. 199.	(29)
Lister	*Quarterly Journal of Microscopical Science*, 1878, p. 391.	(2)
Loeffler, F.	*Berl. klin. Wochenschr.*, Vol. XXIV., 1887, p. 607.	(20a)
Migula	*System der Bakt.*, Vol. II., p. 689.	
,, ...	,, ,, ,, p. 119	(17)
Olsen-Sopp, O. J. ...	*Centralbl. f. Bakt. II.*, Vol. XXXIII., 1912, pp. 1-54.	(31)

Percival, J.	*Agricultural Bacteriology*, p. 60	(28)
Ratz, S. von	*Arch. f. Tierheilkunde*, 1890, Vol. XVI., p. 100.	(17)
Sato, Y....	*Centralbl. f. Bakt.*, Vol. XIX., 1907, p. 27	(26)
Schardinger, F.	*Centralbl. f. Bakt. II.*, Vol. VIII., 1902, p. 144.	(22)
Schmidt (-Mühlheim), A.	*Landw. Versuchs-stationen*, Bd. 28, 1883, p. 91.	(3)
Sewerin	*Centralbl. f. Bakt. II.*, Vol. XXII., 1908, p. 7.	(23)
Ward, A. R....	*Cornell Univ. Ag. Expt. St. Bulletins*, 1899, No. 165.	(4)
,, ...	*Cornell Univ. Ag. Expt. St. Bulletins*, 1901, No. 195.	(4)
Weigmann, H.	*Centralbl. f. Bakt. II.*, Vol. IV., 1898, p. 605.	(30)
,, ...	*Milchztg*, Vol. XVIII., 1889, p. 18	(25)

THE PRODUCTION OF BEET SUGAR IN A CONTINENTAL FACTORY.

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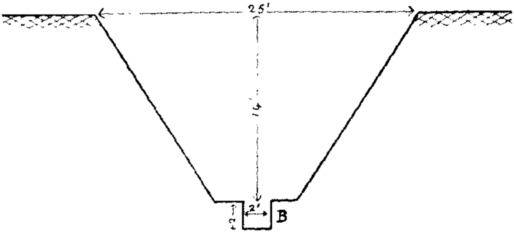
A factory generally starts its "campaign" or season, as soon as the beets are ripe enough. This is often as early as the middle of September on the Continent; and to induce farmers to send their roots earlier or later than the majority, it is not unusual for a factory to offer a rather higher price, as it is very necessary that the supply should be regulated. This question is only vital where very sharp frosts are experienced before Christmas. Badly frosted beets can be worked up if taken before the thaw sets in, but after this they become "woolly" and soft, through the bursting of the cells, and are then liable to give trouble in the factory.

Delivery, Weighing and Sampling of Roots.—The delivery of the "roots" takes place by road, rail, or water. The wagons or railway trucks are weighed over a weighbridge both before and after unloading, and it is the usual custom for sample quantities of about one to two bushels to be taken from the wagons of each farmer for a few days at the beginning and at intervals during the "campaign." These are weighed, washed and reweighed, in order to ascertain the amount of "tare" to be deducted, which usually amounts to from 10 to 20 per cent. Sample roots are also analysed for their sugar content by means of the polarimeter.

Disposal of Roots at the Factory.—The wagons are drawn up alongside the "flumes" or open channels and unloaded mechanically by means of hydraulic levers under the railway trucks, or by handforks. The latter is much the more common method.

The "yard" of a modern factory is divided up into long parallel channels or pits, which are about 100 ft. (more or less) in length, 20 ft. to 30 ft. wide and 4 ft. to 15 ft. in depth. The pit is built of brick or concrete with a "flushed" surface, and its sides slope, so that at the bottom it is only a few feet across. An open channel (see *B*) runs down the middle, having a width and depth of about 2 ft. Iron plates are laid across the top of the gutter *B*, except where the beets are allowed to fall into it. Water rushes along this gutter and thus floats them towards the factory.



CHANNEL ALONG WHICH BEETS ARE FLOATED TOWARDS THE FACTORY.

In this way hundreds of tons of "roots" can be unloaded into this pit continuously. It is also possible to regulate the quantity falling into the gutter.

Washing.—As a rule the beets have to be lifted to a highe level before entering the washing machine. This lifting i done by means of a scoop wheel or chain elevators, revolvin screw "worms" or by the more modern "mammoth" pump The "mammoth" pump consists of a U-shaped iron cylinde having one arm longer than the other. The beets flow int the shorter arm with water, both being gradually raised int a spout and thence into the washing machine by means of th compressed air in the long arm of the U tube, which is provid from a compressor.

The horizontal beet-washers are fitted with a revolving shaft having iron arms, which keep the mass constantly on the move towards the elevator at one end. The trough is fitted with stone catchers.

Weighing.—The beets are next raised by a bucket or chain elevator to the top of the factory and discharged into an automatic weighing machine holding about 800 lb. This machine records accurately the washed weight of all the beets passing through the factory, and in this way a check is obtained both on the outside weighings and on the sugar yield.

Slicing.—As soon as the known weight of beets is reached, the basket tilts automatically and its contents are delivered by gravitation into hoppers, and thence into rapidly revolving cutting or slicing machines. These machines have horizontal plates or discs fitted with sharp fluted blades or knives, which revolve at a great rate and cut the beet into slices known as "*Schnitzel.*" The knives have constantly to be removed for sharpening.

The slices are regular in shape, being about 3 to 4 inches long by one-eighth of an inch in diameter.

The Extraction of the Sugar by the Diffusion Process.—After leaving the "slicer" these slices are conveyed to the diffusers by means of a travelling rake conveyor and shoots (see Fig. 1). The diffusion battery consists of a number of iron cylindrical cells or diffusers, which may hold as much as five or more tons of slices, and are fitted with valves to regulate the supply of hot juice and water, and also with a movable cap top and bases for filling and emptying.

The hot juice and water is forced by pressure through the diffusers and the process of extracting the sugar by diffusion is set up. The hot juice is run from one diffuser to another and after going the whole round of the battery it is drawn off and conveyed into centripetal cylindrical strainers, after which it is measured automatically, heated in pre-heaters and forced into the lime mixers to be mixed with quicklime which has been prepared from the kiln outside, whereby it is purified or defecated.

Purification of the Juice.—A chemical reaction and a mechanical action take place, the lime helping to precipitate

and decompose the non-sugars, and to carry suspended organic bodies down with it. This defecation may take place in a separate vessel or in the carbonatation tank.

Carbonatation is brought about by driving carbon dioxide into the defecated or purified raw juice by means of pumps. This causes the formation of calcium carbonate, etc., which form a precipitate. After this first carbonatation, or saturation of the juice with CO_2, it is pumped up to the filter presses which separate the suspended precipitate and the partly purified juice. This treatment is repeated in a second carbonatation tank and filter press and sometimes a third, where the alkalinity of the juice is finally adjusted.

The residual lime-cake is conveyed by means of transporters to a heap outside and eventually is given to the farmers or sold for about 2*s*. to 3*s*. a ton. It contains:

0·46	per cent.	Potash (K_2O).
1·28	,,	Phosphoric acid (P_2O_5).
1·22	,,	Magnesia.
9·25	,,	Calcium carbonate.
21·23	,,	Organic matter (fine beet rootlets, &c.).
50·00	,,	Water.
16·56	,,	Other constituents.
100·00		

The purified thin juice passes on to the evaporators (see Fig. 2) in order to evaporate some of the water (about 80 per cent. of juice weight) and convert the thin juice from about 13° Brix., into a thick juice having a density of about 60° Brix. In order to effect this operation economically, the evaporation system is based on the principle that the latent heat is used over and over again, in modern factories generally four or five times. The evaporating pans are arranged in series, and the first vessel is heated either by direct steam, exhaust steam, or high pressure vapour from a juice preboiler; the exhaust steam or vapour is condensed after parting with its heat to the juice or liquor in the first vessel.

The vapour which is given off from the juice thus heated, now passes into the heating chamber of the second vessel, where it in its turn is condensed and gives off its heat to the juice in this vessel. The same process is repeated in the third and fourth vessels.

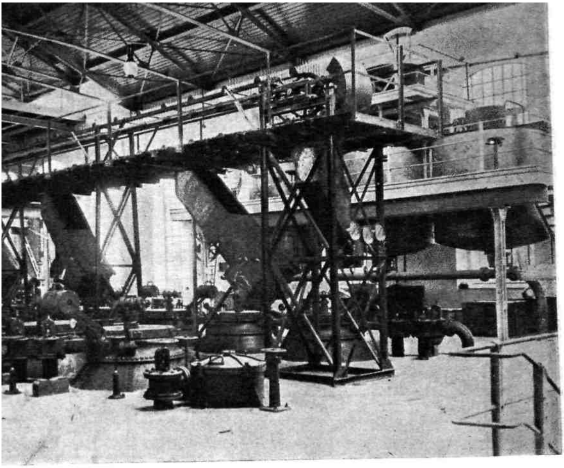
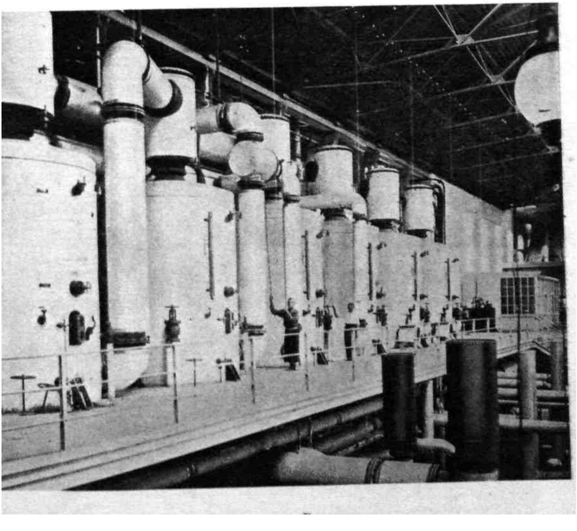


FIG. 1.—SLICE CONVEYOR AND DIFFUSION BATTERY.



The vapour from the fourth vessel now passes, as a rule, through juice heaters where as much as possible of its remaining heat is utilised. It then passes on to the condenser. This vapour is at a very low tension. In order to maintain a vacuum in the condenser, it has to be provided with an air-pump to draw off all incondensible gases, which are always more or less mixed with the vapour, and which would otherwise accumulate in the condenser. It will be seen that 1 lb. weight of steam (as measured in a closed vessel) evaporates nearly its own weight in each of these vessels, *i.e.*, it has almost a fourfold economy.

The thick juice from the evaporators is pumped to another carbonatation or sulphitating installation and after treatment is again filtered and passed on to the vacuum-pan supply tank and thence to the vacuum pans (see Fig. 3).

This final evaporation of the concentrated juice in the vacuum pans is also performed in a comparatively high vacuum, in order that the sugar may boil at a very low temperature, and thus not subject the crystals to caramelisation or "burning." The vapour issuing from the vacuum pans is also condensed in a condenser provided with an air-pump.

In most modern factories there is only one condenser in the whole factory, which serves for both the evaporators and vacuum pans. This thick juice in the vacuum pans is boiled until it reaches a condition known as "massecuite," *i.e.*, a mixture of well defined crystals and concentrated syrup. This "massecuite" is now discharged into crystallisers where it is cooled down by stirring, thus allowing the "grain" to grow, and it is afterwards passed to the centrifugals, which by the rapid revolving action separate the crystals from the adhering syrup, the latter passing through the finely perforated periphery, leaving the crystals of sugar adhering to the sides of the centrifugal basket.

This first sugar has a polarisation of about 96 per cent. to 97 per cent. The syrup is again treated by boiling, etc., as before, and after passing through a second lot of centrifugals yields a sugar having a polarisation of about 90 per cent. The

resulting syrup forms the by-product called "molasses" or agricultural treacle.

Waste-waters or "Effluent."—The waste water that is pressed out from the used pulp and also that from the diffusion battery is liable to cause trouble by giving off noxious gases produced by the fermentation of the organic matter. To avoid this the water is usually treated with lime and an iron salt, and then allowed to run out into a series of "settling ponds," together with the water from the "washer," etc. After being allowed to remain for about 3 days in one pond or basin, the water is run into a second and so on until a fairly pure liquid is obtained. It is sometimes then run across a meadow and into a stream.

The "Steffen" Process.—Factories fitted with this patent process differ from the ordinary ones in having the diffusion battery replaced by a trough fitted with a revolving screw, by means of which the slices are slowly moved through the trough while in contact with hot water or hot raw juice. This is known as "hot infusion." Not so much sugar is extracted, but the advantages claimed are :—

(1) That the initial outlay is less.

(2) That the resultant dry slices contain 30 per cent. to 35 per cent. of sugar instead of 5 per cent. to 6 per cent. in the ordinary slices, and therefore a higher price can be charged the farmer per ton.

(3) That the working expenses are less, because it is the last portion of the sugar that is the most difficult to obtain and crystallise.

It is sometimes worked in conjunction with the diffusion battery, and the manufacturers informed the writer that the extra cost was about £7,500 for a 600 ton factory. In this way it is claimed that almost the whole of the sugar can be extracted. If sugar is cheap, the "Steffen" process can be used alone. Very few factories seem to be fitted with this process, however, and it does not seem to be popular at present. A well-known authority in Germany informed the writer that the price asked for the "Steffen slices" was too high in proportion to their actual feeding value, and that in practice the extra sugar did not give such good results as might be expected

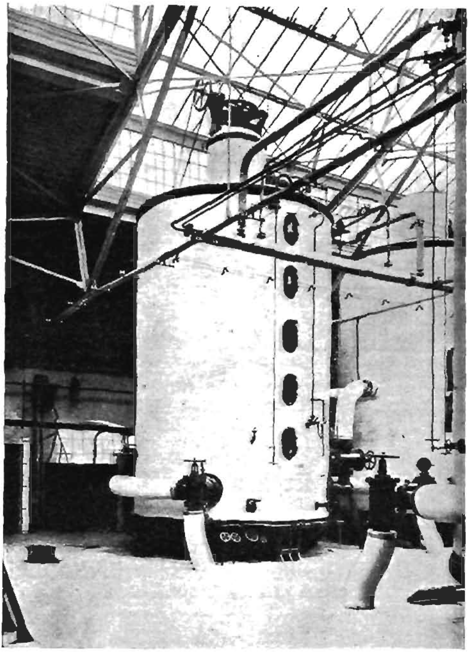


FIG. 3.—"AFTER PRODUCT" VACUUM PAN.

because of the digestible nature of the carbohydrates present in the ordinary slices, which only contain about 5 per cent. to 6 per cent. of sugar.

Heat in Factories.—The old buildings are often "cramped" for room and are badly ventilated. In such cases the atmosphere is hot and oppressive. A modern factory, however, is like one big hall, excellently ventilated and by no means objectionable, and the so-called "obnoxious odour" is a fallacy. The writer stayed at different factories and did not experience any such unpleasantness.

The following data relate to a German factory dealing with 1,200 tons of beet in the 24 hours (unless otherwise stated), and were given to the writer by the manager.

Water.—The purer the supply the better it is. Soft water is preferable to hard, but it is not a *sine qua non*. The quantity required for floating the beets in and washing is about 1,100 gallons per minute. For the diffusion battery, 250 per cent. of the weight of roots is wanted if entirely fresh water is used. If part of the water is purified and used over again, it is possible to do with 120 per cent.

In another factory in Bohemia of 1,000 tons capacity, 1,500 gallons of water per minute (about 7 cubic metres) were required, which is equivalent to 9,640 tons of water every 24 hours.

Coal.—Brown coal is generally used on the Continent. About 6 per cent. of beet weight would be required when using English coal of fairly good quality. Thus for a 1,000 ton factory, about 60 tons of coal would be required every 24 hours.

Limestone.—About 4 per cent. of the beet weight is required. Therefore 40 tons would be used every 24 hours in a 1,000 ton factory.

Number of "Hands."—In this 1,200 ton factory, 270 men are at work during the factory season, but only about 80 in the summer. The remainder work on the land or at other industries, such as brickmaking, when not required in the factory.

Wages.—Staff in the factory; Manager, £500 to £750 per annum; 2 Chemists, £100 to £150 per annum; 1 Engineer, £125 to £150 per annum; 1 Assistant, £125 to £150 per

annum; 2 Book-keepers—1st, £200 to £250 per annum; 2nd, £125 to £150 per annum.

In addition to the salary the manager generally has a house, and the staff have free lodgings, light and heat.

Unskilled Labour.—The men get 4*s.* to 5*s.* a day.

Beetroots.—The cost to the factory of one ton delivered and everything included varies from about £1 to 25*s.* Cost of working same per ton is about 6*s.*

Beet-Sugar Factory at Dinteloord, Holland.*—This new factory is most interesting not only with regard to its modern building and machinery, but also to the fact that it is a co-operative concern and entirely run by farmers.

WORKING ACCOUNT OF THE SEASON, 1910–11.

Received:—		
		£
Net proceeds, sugar		140,921
,, pulp		8,185
,, molasses		3,983
Sugar beets lost and covered by insurance and proceeds of beet sold		127
Balance on shares and direct receipts		110
Total		£153,326
Less Costs of Working:—		
	£	
Depreciation	6,036	
Maintenance	4,285	
Factory materials	5,473	
Wages	3,289	
Salaries and allowances	1,249	
General expenses	1,349	
Interest	509	
Cost of receiving beets, freights, wages, controller's account	10,438	
		32,628
Balance of working account		120,698
Fines received		11
Total		£120,709
Less Charges under Art. 21 of Association:—		
	£	
Interest	3,700	
Redemptions	4,000	
Dividends 4 per cent. on capital paid up	1,050	
Fire insurance	182	
		8,932
		£111,777
Paid to members supplying sugar beet		111,461
		£316
Still to be paid		316
		...

* Some additional particulars with regard to the factory are given in the article on pp. 1014–1017.

ASSETS.

	£	£	£
Engines		64,007	
Depreciation last year	2,772		
" this "	2,802	5,574	
			58,433
Buildings		41,599	
Depreciation last year	1,248		
" this "	1,248	2,496	
			39,103
Lands around the factory		10,305	
Depreciation last year	134		
" this "	2,558	2,692	
			7,613
Electric installation		3,753	
Depreciation last year	178		
" this "	175	353	
			3,400
Laboratory		571	
Depreciation last year	20		
" this "	20	40	
			531
Office furniture		242	
Depreciation last year	4		
" this "	7	11	
			231
Quay		1,638	
Depreciation last year	57		
" this "	57	114	
			1,524
Vessels		612	
Depreciation last year	24		
" this "	24	48	
			564
Railway...		2,757	
Depreciation last year	111		
" this "	111	222	
			2,535
Implements		3,694	
Depreciation last year	211		
" this "	208	419	3,275
Bags			22
Cloths			166
Chalk			333
Cakes			91
Coal			750
Molasses			1,750
Sugar beet seed...			1,570
Stores			1,302
Timber			50
Debtors			15
Buyers of sugar			73
Shareholders			49
Cash			59
Bankers			10,753
Premium of Insurance paid in advance ...			727
Balance on shares still to be received ...			1
			£137,820

LIABILITIES.

	£	£
Subscribed Capital	111,167	
Less to be paid up in case of need	83,375	
		27,792
First mortgage 5 per cent. obligations	75,000	
" 5 " redeemed	3,580	
		71,420
Second mortgage 5 per cent. obligations	25,000	
" 5 " redeemed	415	
		24,585
Creditors		2,574
Deposits		9,617
Interest on obligations during three months		1,200
Costs		280
Balance still to be paid under Art. 26 of the regulations ..		317
Sugar carriage, insurance		33
Coupons of Loan due and unpaid		2
		£137,820

Some 700 farmers are shareholders, and 3,430 shares of £36 each have been taken up. Of these farmers about 300 are "small-holders" and have taken one share each, one fourth being paid in cash and the balance in roots. A large sum was borrowed, but this must be cleared off in 25 years.

A shareholder contracts to provide the factory with a minimum of 15 tons and a maximum of 35 tons of roots per share. About 119,000 tons of beet were worked up during the past season. The total in 1910–11 was 87,000 tons. In 1910 the average sugar percentage was 17·54, the highest 20·4, and the lowest 15·8 per cent., and the factory was able to pay as much as 25*s*. per ton including profits, after making extensive allowance for depreciation, paying 4 per cent. on capital, and redeeming £4,000 of the mortgage.

A copy of the working account and balance sheet for the year ending March, 1911, is given on the previous pages.

A CO-OPERATIVE SUGAR FACTORY IN HOLLAND.

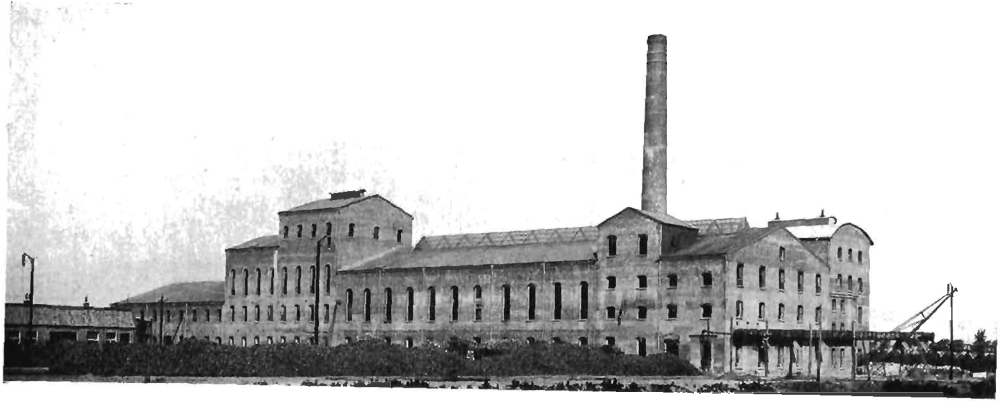
"HOME COUNTIES."

Author of "Sugar Beet: Some Facts and Some Illusions."

The first co-operative sugar factory which was established in Holland is in Zeeland, at Sas van Gent. In 1909–10 it worked up 47,600 tons of beets and in 1910–11 some 53,000 tons. It paid 23*s*. 1*d*. per ton in the former campaign and 24*s*. 2*d*. in 1910–11. The sugar percentage in the one campaign was 16·27 and in the other 17·16. The beets handled daily averaged 780 tons in 1909, and 800 tons in 1910. The factory's capital consists of 900 shares, of about £33 each, on which about £8 is paid. They are practically all held by farmers. The minimum quantity of beets that may be sent in per share is 15 tons, and the maximum 30 tons.

The most modern co-operative factory in Holland is situated at Dinteloord. The order for this factory was given to the contractors on January 9th, 1909; building began in February, and the factory was making sugar on October 13th in the same year.

The figures in the table on the next page show the results



The Co-operative Beet Sugar Factory at Dinteloord, Holland.

of its working in the three seasons during which it has been in operation.

	1909–10.	1910–11.	1911–12.
Beet handled in season	65,000 tons	87,000 tons	119,000 tons
,, daily ...	1,038 ,,	1,333 ,,	1,400 ,,
Price	21*s*. 8*d*. per ton	25*s*. 1*d*. per ton	28*s*. 4*d*. per ton
Members	644	704	720
Shares...	3,150	3,368	3,430

Some three hundred of the members have only a single share each. In 1909–10 the quantity of beets received per share was 21 tons, in 1910–11, 26 tons, and in 1911–12, 34 tons, the maximum allowed being 35 tons.

On the original 3,000 shares the farmers paid £8 4*s*. per share, making a total of £25,000. Four per cent. must be paid on this. The cost of the factory was £135,000. The balance was found by means of "shares, mortgages, bankers and members."

The farmers are justifiably proud of their up-to-date factory. Its manager is the son of the late manager of the biggest sugar factory in the country, the premises of which adjoin the co-operative enterprise at Dinteloord. The factory is to be enlarged, at a cost of from £10,000 to £14,000, to a total capacity of 1,700 tons daily, and may therefore become the biggest sugar factory in Holland.

I found about 3,000 tons of beet piled up outside the factory, the stacks reaching as high as the houses that had been built for the accommodation of the director, chemist, accountant, and engineer, for in a "campaign" which goes on day and night all responsible persons must be on the spot. One of the three electric cranes is alone capable of transferring 400 tons of beets in a day from the barges to the concrete slopes of the storing place. There were convenient facilities for weighing both the railway and the farm wagons of beet, before and after their loads were shot out. The weight of the barges is also taken before and after unloading, by calculating displacement. In order to estimate a consignor's sugar percentage a sample is taken of every four tons lifted out of the barges, of every single wagon load when the beets are received by rail, and of every eight loads when they arrive by road.

As the novice never realises the quantity of water needed by a big sugar factory, it may be mentioned that at Dinteloord some 1,200 tons a day are used. The daily consumption of

lime is 42 tons. Coal costs nearly 9d. per ton of beets. The "campaign" staff, which numbers about 500 for day and night shifts, receives about £5,600 in wages. This does not include the pay of the heads of the factory or the office staff. As it is seldom that one hears of an estimator of the cost of an English factory saying anything about the expense of keeping the place in order when it is not working, it is worth noting that at Dinteloord, without counting head officials and the office staff, there are sixty men on the place after the sugar-making is over.

The shareholders receive wet pulp. Most of them live close at hand so that they prefer wet slices to dry, but the factory tries to squeeze out as much water as possible.

I was assured that only three out of the twenty-five joint stock sugar factories in the Netherlands pay for beets according to the percentage of sugar, in the same way as the co-operative ones do. After the season of 1910–11 Dinteloord paid off more than £4,000 in redemptions. As a result of this season (1911–12) it will probably carry more than £20,000 to reserve, and the members will be paid about *8s. 4d.* more per ton for their beets than they would have got, so I was informed, from the joint stock companies.

The co-operative factory struck me as frugally, but efficiently planned. The co-operators reduce the amount of their machinery by contenting themselves with the production of an unrefined white sugar. It is thought that this is more profitable than refining, which means increased capital, a higher excise duty, and finding trade customers. Everyone who has thought about these considerations attaches weight to them, though an experienced sugar firm may well find a great advantage in refining as well as in simply making sugar.

Dinteloord has been happy in the time of its starting. After the Sas van Gent factory was started sugar prices went down; since Dinteloord's first season, prices have kept going up. The managing director laid the greatest stress on the help this had been. If old hands in sugar beet culture, not unacquainted with sugar manufacture, attach importance to such a piece of good fortune, how necessary it is that English factory promoters should be far-seeing and cautious. When I went

over the Dinteloord factory in November, most of the sugar had already been sold at good prices in advance of manufacture.

From the farmers' point of view, the co-operative factory is no doubt the ideal way of going to work: the agriculturist gets his profits as a beet grower and his dividend as a sugar manufacturer.

The managing director of the Dinteloord factory, who has large farming interests in Zeeland, told me that he would obtain 43 tons of beet per hectare (2½ acres), over an area of 118 hectares. He reckoned in fact that his crop would be over 5,000 tons. The analysis of his first cargo to arrive at the factory reached the high sugar percentage of 19·3, and in later cargoes he had touched 17 and higher, but, he said, "now the rain has come I may be down to 16 per cent." The highest sugar percentage is obtained after wheat and the least after clover and green manure. The English farmer who reads this should remember, of course, that this is experienced culture on highly suitable land.

MUSTARD BEETLES.

R. STEWART MACDOUGALL, M.A., D.SC.

THE MUSTARD BEETLE (*Phaedon betulae*, Küst).

AMONG mustard enemies, *Phaedon betulae*, Küst (*armoraciae*, L.) is very destructive, both as adult and as larva; the leaves especially are destroyed, but the shoots are also gnawed. Scarcely a year passes without some damage by this beetle, and now and again many acres of mustard are spoiled by it. In 1886 Miss Ormerod collated a number of replies from mustard growers concerning this and other insect enemies of mustard, and made a report, which was printed in abstract in the *Journal of the Royal Agricultural Society* for 1897, and more fully in the Ormerod Annual Report for 1897.

Phaedon betulae, often known as the mustard beetle, while choosing mustard as a favourite crop for feeding and breeding on, uses as food plants other Crucifers, *e.g.*, cabbage, rape, turnip, swede, cress, and charlock. The beetle is found in England, Scotland, and Ireland. Complaints concerning it come to the Board chiefly from the east of England, but

in mid-June, 1904, adult beetles were sent from Bath, where they were destroying a bed of watercress.

Description of Beetle.

The adult (Fig. *a*) is broadly oval, and measures just over ⅛ inch in length. In colour it is shining metallic blue or deep green; the antennæ, legs, and under-surface of the body are black. Fowler adds as characteristic, "anal segment of the abdomen with a broad and bright reddish testaceous border." The thorax, narrower in front, is markedly punctured. The wing-covers also show many punctures, these punctures being not only on the lines or striæ that run down the wing-covers, but also in the spaces between the striæ.

The larva, or grub (Fig. *b*), is smoky or dull yellow in colour, spotted with black, and is somewhat hairy; the head is black; the legs are six in number, and are black, but there is,

a *b*

MUSTARD BEETLE (*Phaedon betulae*).
a. Beetle × 3; *b*, Larva, × 3.

in addition, a muscular process at the hind end. Along each side of the body is a row of tubercles, brown in colour; from these tubercles yellow glands can be protruded. The length of the grown grub is about ¼ inch. The grub newly hatched is bright yellow, but the colour becomes dull.

Life-History.

The adult beetles pass the winter in many different shelter-places at and in the neighbourhood of fields where the grubs have been at work—in such shelter-places as mustard stubble, hollow stems of wild plants, rubbish-heaps, at the base of rough grass, under bark, and in cracks in gate-posts and fences.

Issuing from their winter quarters in spring, the beetles lay their eggs on the under-sides of the leaves of mustard; the eggs are yellow. The grubs feed on the leaves, and many can be found on a single leaf. Adult beetles have been sent to the Board in May, June, July and August. The grubs, when full grown, drop away from the food-plants to the

ground, and pass into the soil for pupation; in a fortnight the new adults may come above ground. Both young and old plants are attacked.

Treatment.

1. The beetles may be collected by shaking them off the plants into vessels containing paraffin, or into receptacles coated with tar. The most satisfactory method for such trapping would be the use of a machine that could be pushed between the rows; the machine would be provided with strips of canvas and a catching apparatus in the form of troughs or scoops situated low down within five or six inches of the ground. The canvas strips would be so arranged as to hit against the plants as the machine was pushed between the rows, and thus cause the beetles to fall into the traps below.

Miss Ormerod wrote favourably of such a machine in her Report, 1894, while in 1911 such a machine, in process of being perfected, was exhibited at the Lancashire Agricultural Society's Show. Trapping the beetles before they had laid their eggs would be especially advantageous.

2. Where great numbers of eggs have been laid on young plants a few inches in height, the wisest measure would be to plough in the crop at once.

3. Against the grubs a useful spray would be arsenate of lead, care being taken that the spray reached the under-sides of the leaves. The arsenate of lead would be likely to poison any beetles that ate leaves sprayed with it.

4. Where, later in the year, the beetles are noticed to be migrating to other fields, a shallow trench should be dug across the path of the migrating swarm. If the trench be kept tarred many beetles will be caught.

5. After a bad attack by *Phaedon betulae*, the straw, where it has been left on the field, might, after lying for some time, be burnt in order to destroy sheltering beetles.

THE TURNIP, MUSTARD, AND CABBAGE FLOWER BEETLE (*Meligethes aeneus*, Fab.).

This tiny beetle, belonging to a different family from *Phaedon*, is an enemy to the seed crop of various Cruciferæ. It injures the flowers, and so reduces the amount of seed. Badly infested flowers shrivel. It is often harmful on mustard. It may be alone, or it may be present along with

Phaedon betulae, and is found both on white and on brown mustard. Thus on June 7th, 1909, a correspondent wrote: "I have eight acres of brown mustard, about a foot high, growing very fast. Yesterday I discovered all the tops of the plants covered with small black beetles." On examination these proved to be *Meligethes* and *Phaedon* working together.

The adult beetle is little more than $\frac{1}{12}$ inch long. It varies somewhat in colour, but typically is brassy green or deep green, with the thighs darker.

The larva is a grub with six walking legs on the thorax, and at the hind end of the body a process of service in locomotion. In colour the grubs are greyish or yellowish white; the head is dark.

Life-History.

The beetles lay their eggs in the opening buds, and both adult beetles and larvæ may be found at work in the blossom. The grub, on being full-fed, falls to the ground, and enters the soil for pupation.

OTHER PHAEDON SPECIES.

Phaedon cochleariae (F.) is smaller and brighter blue than *betulae*, and feeds on Crucifers.

Phaedon tumidulus (Gerv.) is found on Umbelliferous plants, *e.g.*, on the wild cow parsnip or hogweed (*Heracleum sphondylium*). I have had it from two Umbelliferous crop plants. In July, 1905, it was sent to me from Yorkshire as harmful to celery. The correspondent wrote: "The beetles seem to commence operations at one end of a row of plants, and work steadily along the row, absolutely destroying the plants; the beetles are in hundreds."

In August, 1905, it was sent to the Board from Settle, where, along with another *Chrysomelid*, it was destroying parsley.

Spurrey as a Forage Crop, and for use on Sandy Soils.

The identification and eradication of Spurrey (*Spergula arvensis*, L.) as a weed were dealt with in this *Journal* in July, 1911 (p. 292). In that article it was stated that "in certain Continental countries, especially Belgium, a variety of spurrey is grown as a fodder crop, and is even sometimes converted into

hay. In his *Farm Foods* Wolff quotes the following analyses of spurrey :—

	Green.		Hay.	
	Total.	Digestible.	Total.	Digestible.
Water	80·0	—	16·7	—
Crude Albumen	2·3	—	12·0	—
,, Fibre	5·3	3·3	22·0	13·1
Nitrogen-free Extract ...	9·7	6·5	36·6	23·7
Fat	0·7	0·3	3·2	1·9
Ash	2 0	—	9·5	—
Albuminoids and Amides	—	1·5	—	7·6

Very light sandy soils might be considerably improved by ploughing in several crops of spurrey in succession, for it will grow in profusion on sands where many plants would not succeed at all, and its growth is so rapid that two or three crops may be raised in one season. Ploughing in would of course be effected as soon as the weed showed the first flowers. Depasturing the crops with sheep would also be very beneficial on such soils."

Since the above note was published some further information on the subject has been collected.

Spurrey is referred to by Johnson and Sowerby in *Useful Plants of Great Britain.* Aberdeenshire farmers have long held it as a pernicious weed, and this view can readily be understood by anyone personally cognisant of the conditions which were to be met with, at any rate thirty years ago, on many farms where the soil was light and sandy. The spurrey grew so luxuriantly as to choke the crop that had been definitely sown, and it can be realised what were the feelings of those who lost a crop of turnips and got instead a crop of spurrey, which they did not aim at and did not know how to utilise. When Johnson wrote in 1865, the plant was grown for fodder in many parts of Europe outside the British Isles, and in various parts of this country also its qualities were rated very highly.

Many foreign writers have been enthusiastic in recommending spurrey as a green manure for sandy soils and as a fodder crop, especially on such soils. Thus in the *Dictionnaire d'Agriculture* (1892), it is stated that this plant is cultivated as a forage crop in Russia, Germany, and Belgium, but only to

a small extent in France. According to Belgian statistics the ordinary variety yields from about 2 to 9 tons of green forage per acre. Over an average of ten years the yield was more than 5 tons per acre. In 1866 8,645 acres were grown in Belgium, and the acreage had risen to 59,200 in 1880.* When used as a fodder crop successive sowings are made. Cattle eat spurrey green or dried, but horses do not seem to care for it. Spurrey is held to have a good influence on the quality of butter. In France it is regarded as particularly useful for ploughing in as green manure, or for forage at the end of a season of scarcity. For this purpose sowing may take place in July and August, and even early in September, about 22 lb. of seed per acre being sown.

In the *Monographie Agricole de la Région de la Campine,* issued in 1899 by the Belgian Ministère de l'Agriculture, spurrey is included as a matter of course among cultivated crops. It is stated that spurrey is an important plant in the Campine country, where the keeping of cattle for butter is the dominating consideration of the farmer. It furnishes an excellent fodder much relished by cattle, and favourably inducing milk secretion. Butter made from the milk of cows fed on this plant is termed "beurre de spergule," and is sought after as being of superior taste, aroma and good quality. Spurrey is well suited to the poor soils of the Campine, though it does better on richer soils. Two kinds are sown, the ordinary species and the Giant Spurrey. The latter is not widely distributed, but is more vigorous and productive and attains two or three times the height of the former. It is for this reason that it requires a soil better provided with plant food than in the case of the ordinary spurrey, which does well on poor soils. In trials at Limburg the giant variety yielded twice and even three times as much forage as the ordinary kind, but required 8 to 10 weeks for its complete development compared with 6 to 8 weeks for the latter kind. From the point of view of nutritive value, however, the ordinary kind is superior. On soils of medium quality it is recommended that the two kinds should be sown as a mixture. The crop is harvested by mowing or by pull-

* According to the *Agricultural Statistics*, 1910, Part IV., 59,485 acres were grown as a second crop in 1909, and 62,417 acres in 1908, the produce being 337,000 tons and 320,000 tons respectively.

ing by hand. Yields vary largely, according to soil and climate, but 4 to 5 tons of green fodder per acre—ordinary spurrey—would be considered good. The cultivation is simple: a shallow cultivation, one harrowing, sowing of the seed broadcast at the rate of 13 to 18 lb. per acre (or 22 to 27 lb. in the case of Giant Spurrey), and a final harrowing. Manuring is not practised. If the giant variety is sown too thinly it becomes hard and woody, loses its nutritive value, and is less liked by stock. In April most farmers in the Campine sow a small area of spurrey, which is useful for the stock for some days in June and July, while at the same time spurrey is sown for the purpose of producing seed, which is harvested about the end of July, when it is mown, dried, and thrashed with flails.

Experiments in Germany showed that manuring with nitrogenous fertilisers materially increased the yield of the crop, nitrate of soda being better than either sulphate of ammonia or calcium cyanamide (*Fühling's Landw. Zeitung*, 1907, p. 148).

Spurrey is strongly recommended for use on light sandy soils as a green manure, and also as forage, in Bulletin No. 91 (Feb. 1893) of the Michigan Agricultural Experiment Station. It is stated that the plant has proved of much value as a forage crop, but is far more valuable for ploughing in as green manure, its physical effect on light sandy lands being very marked. Indeed, it is considered of greater value for this purpose than any other plant similarly utilised on these soils. Sheep and cows were found to be very partial to the spurrey, and it is remarked that "It is in best condition for pasture from four to six weeks after sowing, though if necessary animals can be turned on much sooner. It furnishes excellent pasturage for cattle, especially milch cows, though they often refuse to taste it at first; but after once eating it will leave the richest clover pasture to return to it. Sheep seem to prefer it above all forage, and all stock thrive upon it, when cut or cured, even eating every particle of dry straw that has been threshed for seed." In a report on the trials, it is stated (*Rep. Mich. State Bd. of Agric.*, 1889, p. 81) that "Its value as a manurial plant on these light sands is pronounced. When ploughed under it seems to enrich the soil the most rapidly of all plants used. It

is valuable for a fodder plant, being eaten readily by cows and sheep. It is said to be very valuable for cows giving milk. It is a plant of first value in bringing these sands into productive fields." The Michigan Bulletin quotes several Belgian and other writers, who speak in high terms of the value of spurrey.

New Forms of Potash Manure.

It is now generally known that in ordinary farm practice crops have to be supplied with manures of one form or other containing the three materials referred to commercially as nitrogen or ammonia, phosphate, and potash, and that if a crop is starved as regards one of these, poor results will be obtained, no matter how much of the other two ingredients may be present and available. It is also a matter of common knowledge that there are several different sources of nitrogen and phosphate, and that we may regard the supplies as inexhaustible, but that in the case of potash the only sources of any consequence used at present are the deposits occurring at Stassfurt, in Germany.

At the same time, potash is a very common and widely distributed substance, and it has been estimated that it makes up about 2·8 per cent. of the earth's crust. The whole of this can be traced back to the original rocks—granite and others of similar composition—and to the more recently formed rocks of volcanic origin. The most important components of all these are various felspars, a family of minerals many of which contain potash in considerable quantities. Thus orthoclase, with its sub-variety sanidine, is a double silicate of potash and alumina, and contains when pure 16·89 per cent. of potash. Many other felspars and allied minerals consist of silicate of potash in association with alumina, soda, and lime.

Usually these potash-containing minerals are mixed with such large amounts of quartz, &c., that the amount of potash in the rock is only about 3 per cent., but in various parts of the world there are enormous deposits of rocks and minerals containing higher proportions. For instance, in several of the States of America, notably Maine, Connecticut, Pennsylvania, New York, and Maryland, in many parts of Norway,

and in the Eifel district of Germany, there are masses, usually volcanic in origin, of highly felspathic rocks containing up to 8 or 10 per cent. of potash in the form of double silicates.

In forming an estimate of the value of a material as manure it is not, however, sufficient to have merely the percentage of potash; the condition in which that potash exists must be known too. Potash in a soil or manure may be in either of two forms. It may be in an available state in which the plant can make use of it at once, or it may be in such a condition that years of "weathering" are necessary before the plant can take it up.

For instance, a clay soil will contain up to 2 per cent. or so of potash (also mainly in the form of double silicates), but this may become so slowly available for the use of the plants that application of soluble potash manure may be necessary to obtain maximum production from the soil.

The potash manures usually employed—kainit, sulphate, and muriate of potash—are soluble in water, and it is assumed that plants can make use of these at once if required. At the same time, owing to the absorbent properties of the soil, there is little fear of loss through drainage. In the case of the silicates referred to only a fraction of one per cent. of the potash is soluble in water, or weak acid corresponding to the dissolving power of the plant root, and the question arises as to how far it will become available for the use of crops in a reasonable time.

A considerable number of experiments have been carried out to test this point. Detailed reports and discussion of results will be found, for instance, in the *Transactions of the Highland and Agricultural Society of Scotland*, 1887; *Bulletin* 104, Bureau of Plant Industry, U.S. Dept. of Agriculture, published 1907; *Mitt. der Landw. Ins. Univ. Breslau*, 1911; *K. Landtbr. Akad. Handl. och Tidskr*, 49 (1910), No. 8 (*abs. Exp. Station Record*, U.S. Dept. of Agri., Vol. xxv., No. 5); *Deut. Landw. Presse*, 38 (1911), No. 63.

The results of these different experiments are to a great extent contradictory and inconclusive, possibly owing to the fact that the effect of a potash manure is seldom so clearly marked as that of nitrogenous or phosphatic manures. In

the case of some of the experiments, an examination of the results makes it appear probable that the soil originally contained sufficient potash to meet the requirements of the crop grown.

It is not intended, however, to discuss the experiments in detail, but to call attention to the importance of "availability." At the present time certain new substances are being offered as potash manures, and in such cases intending purchasers would do well to obtain an analysis showing the proportion of potash soluble in water. For purposes of comparison, it may be remembered that kainit usually contains about 12 per cent. of potash soluble in water.

Friskney Credit Society.

Friskney is a large rural parish in Lincolnshire, on the shore of the Wash, between Boston and Skegness. Its area is about 7,000 acres, and its population about 1,300, not at all closely packed together. Some of the land is fairly high-lying and dry, but much has been reclaimed from the fens on the one hand, and from the sea on the other. Much of it is of good quality, commanding rents up to £2 10s. or even £4 per acre. There are 121 small holdings of from 1 to 50 acres, besides 75 acres held in plots of an acre or less, generally in long, very narrow strips. Among the most paying crops are potatoes, cabbage, celery and mustard: early potatoes, which come into the market after the Jersey supply, sometimes fetch £25 or £30 per acre. Agriculture as practised by small occupiers is a prosperous business in this neighbourhood, and it is said that all dues and rates are punctually paid, and that it is seldom that a labourer is out of work.

Such a parish, with so many small agriculturists, some of whom own their holdings, is a suitable place for a Co-operative Credit Society; and owing mainly to the influence of Mr. Woodhead, J.P., who himself owns and works a moderately-sized farm in the parish, and of Mr. Robinson, the schoolmaster, such a Society was started in 1903, with the help of the Co-operative Banks Association, which has since been absorbed in the Agricultural Organisation Society. The

founders had also the benefit of the advice of Mr. Sutton-Nelthorpe, the Chairman of the pioneer credit society at Scawby in the same county. The rules adopted were of the same character as those that govern all the other 43 credit societies now at work in England and Wales. They provide that only residents of Friskney of good character can be members, that the liabilities of the members for debts due by the Society shall be unlimited, (except in the case of guarantor members), that loans shall be made only to members, and only for purposes which the Committee think are likely to prove profitable to the borrower, and that all profits from the working of the Society shall be carried to a reserve fund which cannot be divided among the members.

The Society began with 20 members, and the number gradually increased, till in 1911 there were 33. They include 13 farmers, 6 labourers, 3 farm servants, 2 cottagers, a wheelwright, a blacksmith, a road foreman, a grocer, an overseer, an engine-driver, a builder, the schoolmaster and the Vicar. Twelve of the members are owners of land. Mr. Woodhead has been chairman from the beginning, the Secretary is a road-surveyor, and the schoolmaster is Treasurer. The Committee of seven, who are elected by the members every year, now include two farmers, the Vicar, a grocer, a blacksmith and a labourer. The Secretary receives a salary of £1 per annum, but the rest of the work is done free of cost to the Society, and the total cost of management, including salary, stationery, affiliation fee to the Agricultural Organisation Society, etc., was only £1 10*s*. 1*d*. last year.

The Society has from the beginning charged only 5 per cent. on loans to its members—that is, one penny per pound per month. It began by making three loans amounting to £50 in its first year, and last year advanced six loans amounting to £89. In the last 8 years it has made 33 loans of the total amount of £515, averaging £16 per loan. The loans were all made to members for profitable purposes, and have been repaid punctually, though in some cases the Committee have seen fit to extend the time fixed for repayment for good cause shown. At the end of 1911 there were 14 loans outstanding of the aggregate amount of £196, none

of them overdue. Five loans were made to enable the borrowers to take small holdings, five to enable them to retain stock for better prices, two to buy seed potatoes and pigs, one for the purchase of stock, and another for the purchase of a reaper.

In order to obtain money to meet these loans the Society began by offering to take deposits at 3 per cent., and in the first year received £82 on these terms. It has since received and paid deposits every year, and at the end of 1911 held £152 deposited by 9 persons, 5 of whom were members, and 4 non-members. Last year, finding the amount required for loans was more than the amount received on deposits, it raised the rate of interest paid on deposits to 3½ per cent. It also borrowed £20 from a bank at 5 per cent., and £30 from an Insurance Company at 4 per cent., which shows that its credit is good.

For the first three years of its working, the Society's profits were not enough to pay the Secretary's salary of £1, and the net result of the year's working showed a small loss. Since then there has been a profit every year, and at the end of the year 1911, the balance-sheet showed that the total profits up to date amounted to £8 7*s*. 2*d*., as follows: Assets £205 7*s*. 2*d*., including £196 out on loan to members: Liabilities £197, of which £152 were due to depositors, £15 to a Bank, and £30 to an Insurance Company. The surplus of £8 7*s*. 2*d*., which represents accumulated profits, forms an indivisible reserve fund, and is the property of the Society, on which it pays no interest.

Here then we have a society managed by the villagers themselves, with practically no help from outside, on sound business principles. It has been able to borrow at low rates of interest on the credit it has built up for itself by good and careful management, and has been able to make loans to its members for profitable agricultural purposes at 5 per cent. per annum. As the reserve fund grows, and the interest obtained on it increases, the Society may look forward to being able to lend to its members at even a lower rate than 5 per cent., which is itself a rate at which few small agriculturists outside these credit societies can borrow, if they can borrow at all.

Costs of Production in Agriculture.

One of the objects to which the grant for Agricultural Research, recently placed at the disposal of the Board of Agriculture and Fisheries, will be devoted is the maintenance of an Institute for the study of the Economics of Agriculture, a subject of which little has been heard hitherto in this country. A marked feature of the progress in recent years in the technique of business management has been the prominence given to what are technically known as "costs." The majority of large manufacturing concerns have nowadays a costs department, one of whose functions it is to ascertain and record the cost of each operation that is required to convert the raw material into the finished article ready for the market. Thus, if the manufactured product is worth a sovereign, the costs department ascertains to the fraction of a penny the value of the raw material used, the cost of labour at each successive stage of manufacture, and even such details as, say, the cost of the coal used in producing power for any necessary machinery, the fractional share of management charges properly debitable to the article in question, and so on, in as minute detail as may be considered desirable. It is thus possible to institute comparisons and so check waste, to drop unprofitable "lines," and develop profitable departments.

So far, work of this kind has not been done in relation to agriculture in this country, but a beginning has been made in the United States by the Bureau of Statistics, and some interesting papers on the subject will be found among the publications of that department.

The need for accurate information on the cost of agricultural operations may be illustrated from the recent controversy in the daily press on the subject of the cost of growing sugar beet. No general agreement has been reached on this vital question—vital because on the answer to it the useful employment of many thousand pounds of capital may depend—and estimates differing by 100 per cent. from one another have their advocates, each of whom produces an ostensibly convincing array of figures. A common feature of all these figures is that they are based on arbitrary assumptions as to the cost of such things as, for example, horse labour, a subject

which gave rise to an animated and inconclusive discussion of experts at a meeting of the British Association two years ago. Another fruitful subject of conflicting views arises from the question: What is the cost of producing beef or mutton? Some experts say that the profit is nil, others that corn-growing does not pay, but stock-keeping does. The controversy arises because there is no foundation of hard statistical fact on which to build. No one has come forward, for example, to say that he has collated figures from one hundred typical farms, and that the prevailing cost of keeping a horse is so much, and that on the average it works so many hours per diem, two figures which, if obtained, would go far to settling the question. As a rule, farming does pay, but the question as to what description of farming pays best under defined conditions, and why, cannot be answered.

The method adopted by the United States Bureau of Statistics is to place qualified persons on the farms to keep or obtain records of the times spent on each description of agricultural work, the exact weight, and, as far as possible, cost, of all materials produced or consumed on the farm. The particulars so obtained are carefully abstracted and tabulated, and precise information as to costs is obtained. The following are typical examples:—

AVERAGE ANNUAL COST PER ACRE OF FARM MACHINERY IN MINNESOTA.

	Dollars.
Binders	0·181 (9*d.*)
Drills	0·075 (3½*d.*)
Ploughs	0·087 (4*d.*)
Threshing outfit ...	0·335 (1*s.* 5*d.*)

These figures are based on averages for a large number of figures for (1) original cost of the machines; (2) number of years in use; (3) depreciation; (4) repairs; (5) acres operated on per year.

AVERAGE ANNUAL COST OF MAINTAINING A FARM HORSE IN MINNESOTA.

	Dollars.	
Interest on investment	5·54	
Depreciation of horse	5·56	
,, ,, harness	2·10	
Shoeing	1·42	
Food	63·49	
Labour	11·88	
Miscellaneous	0·40	
Total	90·40	[=£18 16*s.*]

Average number of hours worked per day = 2⅝

Cost per working hour = 0·0925 [= 4·6*d.*]

It cannot be suggested that these figures are applicable to this country. The point of interest is that they are based on the average of a large number of actual figures obtained over a series of years on many farms, and consequently represent fact, not opinion.

It is necessary, however, to point out that the issues appear to be simpler in the States, in so far as agriculture there seems more specialised, and consequently less complex from a book-keeping point of view. A farmer who confines himself to producing wheat or cotton has a much simpler problem of costs to solve than one who takes up mixed farming in this country, and has to combine corn-growing with beef or mutton production, and, perhaps, horse-breeding as well. Then, again, intensive farming and its necessary accompaniment, an approved rotation of crops, presents a more difficult problem.

Changes in the Number and Size of Agricultural Holdings.

The Acreage and Live Stock returns of Great Britain for 1911 again show an increase in the number of small holdings. The number of holdings of the smallest class—1 to 5 acres—increased in England and Wales during the year 1910–11 by 2,085 and in the 5 to 50 acre class by 1,601, so that the total increase during the year was 3,686. So substantial was this increase that the number of small holdings in England and Wales is now greater than in 1903.

From 1903 to 1908 small holdings declined steadily in England, and although in Wales there was no general tendency, the lowest point in England and Wales as a whole was reached in 1908. This continued decline was only consistent with the tendency disclosed by previous periodic returns at various dates. Thus in 1890 the number was calculated at 309,290 and in 1895 it had fallen to 299,378. In the three years since 1908, however, there has been an increase of 5,312 or nearly 2 per cent. The changes in the number of holdings of from 1 to 50 acres in size are shown in the first table on the next page.

The above figures represent only net increase and not the number of new small holdings created. The contraction of the

cultivated area year by year involves the disappearance of a number of holdings, and probably small holdings are

Year.	England.	Wales.	Total of England and Wales.
1890 *	267,346	41,944	309,290
1895	257,646	41,732	299,378
1903	*248,936*	*41,735*	*290,671*
1904	248,104	41,895	289,999
1905	247,854	42 013	289,867
1906	246,934	41,992	288,926
1907	*246,896*	*42,197*	*289,093*
1908	245,102	42,074	287,176
1909	245,856	42,155	288,011
1910	246,584	42,218	288,802
1911	*250,166*	*42,322*	*292,488*

* *The holdings of one acre have been deducted in the proportion ascertained in 1895.*

swallowed up by urban encroachments in greater numbers than larger farms. Indeed, to this cause the diminution of small holdings in earlier years was largely attributed. Not only, therefore, has the creation of small holdings since 1908 been *sufficient to make good this wastage, but to increase substantially* the total number of small holdings in the country.

An indication of the extent to which the larger holdings are being broken up to satisfy the demand for small holdings is afforded by the figures in the following table showing the changes in the number of holdings of all sizes in England and Wales.

—	1 to 5 acres.		5 to 50 acres.		50 to 300 acres.		Over 300 acres.	
	1911.	1910.	1911.	1910.	1911.	1910.	1911.	1910.
England.	82,538	80,429	167,628	166,155	110,110	109,981	14,377	14,531
Wales...	10,210	10,234	32,112	31,984	17,965	17,996	370	364
England and Wales	92,748	90,663	199,740	198,139	128,075	127,977	14,747	14,895

SUMMARY OF AGRICULTURAL EXPERIMENTS.*

FIELD CROPS.

Influence of Time of Cutting upon the Yield and Composition of Hay (*Jour. Agric. Sci., January,* 1912: *Dr. C. Crowther and Mr. A. G. Ruston, Univ. of Leeds*).—The variation in the composition of fodder crops with advancing maturity has been well investigated on the Continent, but has received little attention in this country. In view of the differences in climatic conditions, it seemed doubtful if the changes in the composition of fodder crops would take place so rapidly here as on the Continent, where a delay of only a few days in cutting has apparently led to a serious depreciation of the crop. Records are therefore given of tests made with "seeds" hay grown in Yorkshire. In each case the hay was the produce of a seeds mixture in which clovers predominated, though in the second year of the test the leguminous plants were not so well established, so that the hay was to a greater extent composed of rye grass.

The first cuttings in each year were made when the rye grass was in full flower, and three other plots were cut at intervals of about a fortnight. At the second cutting the rye grasses were distinctly taller, and seed formation was actively in progress, whilst the clovers were beginning to flower. At the third cutting the grasses were ripening, and the clovers were in full bloom, while at the last cutting the whole crop was decidedly ripe.

Care was taken to prevent mechanical loss, but had the crop been harvested in the usual way, there would have been considerable loss of seeds, &c., at the time of the fourth cutting. The crops obtained in the two years were as follows:—

1909 Crop.		1910 Crop.	
Date of Cutting.	Yield of Hay per acre.	Date of Cutting.	Yield of Hay per acre.
June 10	32 cwt.	June 9	34 cwt.
" 28	42 "	" 23	46 "
July 15	48 "	July 7	47 "
Aug. 3	50 "	" 21	50 "

The crop of hay obtained from each cutting was analysed and estimation made of its digestibility and feeding value.

Taking the results of the two years, the chief changes going on in the period were:—

(1) A steady increase in the proportion of crude fibre;

(2) A gradual fall in the proportion of amides up to the third cutting, after which the fall was very pronounced;

(3) A rise in the percentage of silica in the ash.

* A summary of all reports on agricultural experiments and investigations recently received is given each month. The Board are anxious to obtain for inclusion copies of reports on inquiries, whether carried out by agricultural colleges, societies, or private persons.

	Pounds per Acre in the Different Crops, 1909.			
	1st Cutting.	2nd Cutting.	3rd Cutting.	4th Cutting.
Total Dry Matter	3,220	4,180	4,800	5,100
Crude Protein, including	470	535	635	610
True Protein	330	390	465	520
"*Amides*" ...	140	145	170	90
Ether Extract, (Fats, &c.)	85	70	75	75
Crude Fibre	880	1,280	1,520	1,760
Pentosans	670	930	1,160	1,230
Soluble Carbohydrates . .	830	1,040	980	940
Total Ash, including . .	285	330	425	490
Silica	43	61	112	127
Lime	27	28	40	39
Phosphoric Acid ...	18	13	15	20
Potash	41	42	42	55

The digestibility of the different crops was estimated, and the starch equivalent calculated.

The starch equivalents of the total crop per acre in 1909 were as follows:—

	For Maintenance.	For Production.
1st Cutting ...	*2,000 lb.*	*1,300 lb.*
2nd ,, ...	2,500 ,,	1,530 ,,
3rd ...	2,740 ,,	1,610 ,,
4th ...	2,700 ,,	1,490 ,,

It is concluded that in both years the third cutting gave the most valuable crop, but a fair amount of latitude in the time of cutting—say, a week or ten days—may be allowed without seriously impairing the nutritive value of the crop.

If left too long, the fall in the digestibility more than counterbalanced the increase in the weight of the crop, even though no mechanical loss of seeds, &c., took place, a loss which could not be *prevented in ordinary farm practice.*

Varieties of Barley (*Beds. C.C., Agric. Educ. Com., Report upon the Barley and Sugar Beet Plots,* 1911).—Ten varieties of barley were tested in 1911 on a light, sandy soil. In consequence of the hot, dry weather, the crop ripened off too quickly, and, in addition, all the plots were damaged by smut. In this year Maltster gave the heaviest yield, and Princess (a new Svalof variety) the lowest, while Standwell, though unsatisfactory as regards weight of crop, produced the best quality sample. The average yields per acre in the five previous years were: Kinver Chevalier, 43 bush.; Goldthorpe and Prize Prolific, 40 bush.; Maltster and Burton Malting, 39 bush.; Standwell, 38 bush.; and Binder, 37 bush.

Growth of Sugar Beet (*Beds. C.C., Agric. Educ. Com., Report upon the Barley and Sugar Beet Plots,* 1911).—In 1911 the various experiments were carried out at Ridgmont under a scheme assisted by the Board with a view to comparing results obtained with sugar beet in various districts. The soil on the field in which the plots were laid out was a somewhat heavy clay. It was dunged in the previous autumn at the rate of about 15 to 16 tons per acre, and twice ploughed. Tables are given showing the weights of

When grown on the flat in rows 18 in. apart, the weight of washed roots was 12 tons 12½ cwt. per acre, as compared with 11 tons 13 cwt. and 9 tons 13 cwt. when grown in rows 21 in. and 27 in. apart respectively. Of the varieties tried, Rabbethge and Giesecke's Klein Wanzleben gave the heaviest crop—15 tons 7 cwt.

Different artificial manures to supplement the dung were tried.

The percentage of sugar varied very little; it was between 18 per cent. and 19 per cent. on all the plots, except where the beet was grown in rows 27 in. apart, in which case it was only 17·7 per cent.

Valuing horse labour at 2*s.* 3*d.* a day, farmyard manure at 4*s.* 6*d.* a load, and other items at actual prices, the cost per acre of growing beet on the flat in 18-in. rows was £13 1*s.* 2*d.*, against which is set the crop of 12½ tons of washed roots. This is compared with an acre of mangolds, which, in rows 27 in. apart, cost £10 16*s.* 4*d.*, and gave a crop of 20 tons.

SOILS AND MANURES.

The Phosphate Nutrition of Plants (*Jour. Agric. Sci., January,* 1912: *Mr. A. Baguley, Univ. Coll. of N. Wales*).—A good deal of experimental work has been carried out to determine the value of finely ground naturally occurring mineral phosphates as manures for plants of various kinds. In the experiments recorded in this paper the question was approached by artificially preparing insoluble phosphates of various kinds, and giving them as the only source of phosphoric acid to plants grown in pure sand.

In this way ferric-, aluminium-, and calcium-phosphates were tried with oats, swedes, and peas, and as a control the same plants were grown with superphosphate as the source of phosphoric acid. With aluminium and ferric phosphate, both oats and swedes turned out finer and healthier plants than with superphosphate. Peas grew into healthy, sturdy plants, but were not so early or fruitful as when grown with superphosphate.

With calcium phosphate the results were different. Oats did not thrive any better than those grown without phosphate at all, and died without producing any ears. Until about six weeks after sowing, the swedes appeared to do as badly as the oats had done, but then they began to grow vigorously, and at the end of the season they were good, healthy plants, though by no means so forward as the others. Peas grew moderately well with calcium phosphate, but the plants ripened early, and the crop was poor.

Rothamsted Experimental Plots in 1911 (*Annual Report of the Rothamsted Exptl. Sta.,* 1911).—The effects of the exceptionally hot, dry summer of 1911 were well marked on the different crops and plots. In the case of wheat the yields were good, the continuously unmanured plot giving 12½ bush. per acre, and the plot grown after a bare fallow in alternate years 17 bush. per acre, which is higher than for many years past. The weights per bushel were remarkably high, the average of all the plots being 65·5 lb.; the weight on one plot was 66·8 lb., the highest figures yet recorded. Barley was exceptionally poor, and the continuously unmanured plot yielded less than 5 bush. per acre.

On land cropped with them every year, mangolds were almost a failure, except on the plots receiving farmyard manure. On others the soil caked and germinating seed was unable to get to the surface.

Where, however, farmyard manure was given, the texture of the soil was so much better that a good plant, and crops up to 21 tons per acre, were obtained.

In a comparative test with various forms of nitrogenous manure for mangolds, nitrate of soda gave better results than nitrate of lime, sulphate of ammonia, and calcium cyanamide.

Manuring for Milk (*Midland Agric. and Dairy Coll., Bull.* 2, 1911–12).—This experiment, previously noted (*Journal,* August, 1911, p. 416, and January, 1911, p. 852), was continued in the year 1911, and the results of the grazing in that year are given in the Bulletin forming the Third Interim Report.

The experiment was begun in 1909, when two plots of 4 acres each were laid out in a grass field, which, through bad management in laying down, and annual removal of hay, was in a very poor condition. In the spring of 1909 both plots received 10 cwt. of ground lime per acre. One of them received in addition 4 cwt. superphosphate and 1½ cwt. sulphate of potash per acre, and during the three years the two plots have been grazed separately by cows in milk to determine the improvement due to the superphosphate and the sulphate of potash. No manures have been given to either plot since 1909.

In 1911 the effect of the manures was not so marked as in the previous season, and, owing to the dry season, the yields of milk from both plots were adversely affected. In spite of these, the manured plot increased the yield of milk at the rate of 81 gallons an acre for the grazing season, compared with the yield produced by the unmanured plot. In 1909 the difference was 84 gallons, and in 1910 86 gallons per acre. As the cost of the manures was only 29*s.* an acre, the manuring has even up to the present resulted in a handsome profit, and its effect appears to be by no means exhausted.

The Manurial Value of Phosphoric Acid contained in Oil Cakes (*Jour. Coll. of Agric., Imp. Univ. of Tokyo, Vol.* I., No. 3, 1911).—In Japan, oil cakes are largely used as manures, and it is pointed out that while they are chiefly valued as a source of nitrogen, they also contain appreciable quantities of phosphoric acid, *e.g.*, analyses of soy bean cake and rape seed cake show 1·3 per cent. and 2·25 per cent. respectively of total phosphoric acid. Experiments previously carried out have, however, indicated that this is in a much less available condition than that in animal manures, such as steamed bone flour.

The greater part of the phosphoric acid appears to be contained in a substance, phytin, which is split up under the action of an enzyme, phytase, and the phosphoric acid liberated in a soluble inorganic compound.

The experiments, of which an account is given, were designed to test how far the low availability of the phosphoric acid in rape seed and soy bean cake is due to the destruction or weakening of the phytase in the heating during the extraction of oil, and to see if the availability could not be increased by adding to the cake a quantity of rice bran—a substance which contains considerable quantities of the phytin-splitting enzyme.

It was found that rice bran did, under suitable conditions, transform the organic phosphoric compounds of the cakes to simple inorganic soluble ones.

WEEDS, INSECT AND FUNGUS PESTS.

Tall Oat Grass and Onion Couch (*Jour. Agric. Sci., January*, 1912).—One of the commonest grasses in this country is Tall Oat Grass (*Arrhenatherum avenaceum*, Beauvais), and it is occasionally included in the "seeds" mixture for temporary or permanent pasture. In some localities a form of this grass, known as Onion Couch [or Knot Grass or Pearl Grass], becomes an extremely objectionable weed on arable land. This plant is identical in appearance with Tall Oat Grass, except that at the base of the stems a chain of bulbs is formed. Each bulb is capable of giving rise to a new plant, and as cultivation merely breaks up the chain of bulbs, the weed is extremely difficult to eradicate, while a liberal supply of seed is formed in June and July.

Botanists differ as to whether the Tall Oat Grass and the Onion Couch are distinct species, or whether the bulbous form is assumed as a result of variation in conditions of habitat.

To test this point, seeds of Onion Couch were gathered from various localities and sown by Miss L. M. Underwood at Rothamsted in various soils with different amounts of moisture, shade, and at different rates. The two kinds of seed, which were indistinguishable, were sown in September and were well up before winter set in. Bulbs began to appear in the following March, and by May all the pots sown with seed from the Onion Couch were producing chains of bulbs, while the plants from Tall Oat Grass Seed remained normal.

It is concluded that the habit of forming bulbs is hereditary, and does not depend on the conditions of the habitat. Except for the bulbs, no difference could be noted between the two plants.

Investigations on Potato Diseases (*Jour. Dept. of Agric. and Tech. Inst. for Ireland, January*, 1912).—The Third Report, by Mr. G. H. Pethybridge, gives an account of the work done in 1911 at the temporary research station at Clifden, Co. Galway. Owing to the exceptionally dry summer, comparatively little damage was done to the potato crop by the various diseases, and the investigations were therefore carried out under unfavourable conditions. Various experiments were made with regard to the prevention of ordinary "blight" or potato disease (*Phytophthora infestans*, de Bary), and the results may be summarised as follows:—

(1) Bordeaux mixture made with lime was slightly more effective than when soda was used, though it is pointed out that the mixture with soda is more easily prepared.

(2) The plots sprayed twice, starting late (July 17th), were least attacked by disease. This was owing to the dry July and August, in which disease made little headway, but it did develop in the wetter September, and the latest sprayed plants were better fitted to resist it. The conclusion previously arrived at—that spraying prevents disease best when done before a period of wet weather—is thus confirmed.

(3) Even in a dry summer like 1911 spraying was effective and profitable, not only in the West of Ireland, but also in the drier climate of Co. Dublin, where it resulted in an increase in total crop of about two tons per acre, and reduced the proportion of diseased tubers.

(4) Lime-sulphur spray was found to be utterly useless in warding off the disease.

(5) Soaking "seed" in copper sulphate solution and in Bordeaux

mixture injured the tubers without preventing disease. It was, however, found possible to destroy the fungus on diseased tubers (without seriously affecting the vitality of the tubers) by heating to 50° C.

Attempts to discover the exact source of infection of tubers did not yield conclusive results, though it seems probable that it is not due to a preliminary contamination of the soil with resting spores from a previous season.

The Stalk or Sclerotium Disease.—It was concluded in 1910 that plants are infected with this disease by air-borne spores, and not by mycelium or spawn in or on the surface of the soil. This was confirmed in 1911, when some old grass land was broken up and planted with potatoes. The soil was free from the disease, and yet very many of the plants were affected by the stalk disease, infection doubtless taking place from spores borne by the air from "spore-cups" present in abundance on neighbouring land.

The Stalk disease appeared to suffer no check from the dry season, and about the end of July had made such progress that a couple of nights of strong wind broke down the infected plants at the point of infection.

Various methods of treatment to prevent this disease were experimented with, but were quite ineffective. A very striking result was, however, obtained on a plot which was planted late (May 27th), as compared with April 6th in the other plots. Only 5 per cent. of the plants on this plot were attacked, as against from 95 per cent. to 100 per cent. on the others. The total yield of potatoes was, however, somewhat seriously reduced.

Black Stalk Rot and *Corky Scab* were much less prevalent than in previous years, and it was impossible to obtain definite results, though in the case of the Scab, application of Flowers of Sulphur at the rate of 6½ cwt. per acre appeared to be beneficial, as it not only reduced the proportion of diseased tubers, but increased the total crop. Short accounts are also given of "Leaf-curl" and "Leaf-roll," "Sprain," "A new form of Tuber-Rot," and "Pitting Experiments." (A note on the 1910 investigations appeared in this *Journal* for August, 1911, p. 419.)

A Disease of Sweet Peas, Asters, and other Plants (*Roy. Bot. Gard., Kew, Bull. Misc. Inform., No.* 1, 1912).—Mr. G. Massee describes the minute parasitic fungus (*Thielavia basicola,* Zopf), and gives an account of investigations carried out at Kew. In recent years the damage done to asters and sweet peas has been so extensive in some localities that their cultivation has had to be abandoned. Culinary peas and many other plants may also be affected, while in Europe and the United States tobacco has suffered to a serious extent. The symptoms vary a little according to the extent to which the soil is infected, but generally the disease is only serious during the seedling stage. In the case of peas, both the plumule and radicle may be attacked, and then the seedlings will not appear above ground at all. More commonly, however, the root only is directly affected, in which case the plant attains considerable growth, then suddenly wilts, turns yellow, and dies. Another very common symptom is known to growers of sweet peas as "streak" or "stripe," characterised by the presence of dingy yellow streaks on the stem and leaves. In asters the plants are killed outright during the seedling stage; when about 3 in. high they begin to wilt, and

soon fall over, as in the disease known as "damping off." In both peas and asters the roots of diseased plants are shrivelled and blackened.

Infection appears to take place only from the soil, and the disease is often spread by means of manure, on which material the fungus flourishes and reproduces itself at a rapid rate. It is practically impossible to cure affected plants, but preventive measures can be taken, and in the article directions are given for sterilising the soil by means of dilute solutions of formalin.

Varieties of Potatoes immune to Wart Disease.—A small experiment was carried out last season at Abertillery in Monmouthshire on the lines adopted by the Board in the experiments described in the February number of the *Journal*, p. 915. A plot infected with Wart Disease of potatoes was selected and planted with potatoes known to be susceptible to the disease, as well as those believed to be immune. The resistant varieties planted were Aberlady Early, Conquest, Golden Wonder and Langworthy. These all proved immune, were white when cooked, and, except Golden Wonder, were floury. The following report was made on their quality: Aberlady Early, excellent, a very satisfactory potato; Conquest, excellent; Langworthy, very good; Golden Wonder, fair, rather small.

The potatoes of the other varieties tried were all badly affected with the disease.

A New Insect Pest of Mangolds and Beet (*Second Report on Economic Biology, by W. E. Collinge*, 1912).—During May, 1911, larvæ of *Cionus scrophulariæ*, Linn., were received on mangold and beet leaves, to which they were doing considerable damage. Hitherto no account of this insect attacking cultivated plants has been recorded, and it has not been regarded as of any economic importance, except for the fact that it feeds upon the knotted figwort (*Scrophularia nodosa*, Linn.), and to a certain extent keeps down that weed.

Contact Insecticides (*Michigan Agric. Coll., Tech. Bull. No.* 11).—The term "contact insecticide" is used as referring to those substances which kill through coming in contact with the outer surface of the insect body in contradistinction to those which must be eaten to be effective. Little work has been done to determine exactly how such substances kill, but the belief commonly held is that they act by plugging up the breathing pores, thus causing death by suffocation. This was the first point tested in the experiments reported on in this bulletin. It was found extremely difficult to kill many insects in a reasonable time merely by depriving them of air, and it is concluded that the certain and fairly rapid death caused by such materials as kerosene and gasolene cannot be due to the stoppage of the tracheæ alone. It was also found that air saturated with the vapour of various insecticides was nearly as effective as the liquids themselves. Further tests showed that in the use of many insecticides, such as kerosene, gasolene, creolin and pyrethrum, vapour penetrated the tissues and caused death long before the liquid or powder itself had time to penetrate the chitin, or to cause suffocation by the plugging of the tracheæ. The evidence gathered seemed to show that the vapours after absorption in the insect body become mainly effective through some tendency their presence exerts to prevent absorption of oxygen by the tissues.

Effect of Lime-Sulphur Wash on Scale Insects (*Michigan Agric. Coll., Tech. Bull. No.* 11).—Lime-sulphur wash is recognised as being a special rather than a general insecticide, and is recommended by entomologists as being particularly effective against scale insects. Its action was found to be peculiar. Unlike the other contact insecticides reported on, no proof could be obtained that lime-sulphur wash had penetrated into the tissues of insects. It appeared to have very little effect on large insects having heavy chitinous walls, and even when applied to a small portion of a very delicate body-wall, such as the body of a covered scale insect, that part might be killed before the rest of the body.

Various theories were tested, but it was finally concluded that its action on scale insects was due partly to the fact that it takes up oxygen in comparatively large quantities, thus indirectly suffocating the insect which it covers, and partly to its effect on the wax at the margin of the scale. It was found that this was affected by the wash, with the result that the insects were absolutely sealed in under the scale covering.

DISEASES OF LIVE STOCK.

Diseases of Live Stock (*Board of Agriculture and Fisheries, Rept. of Proceedings under Disease of Animals Acts,* 1910).—This report includes particulars of special investigations carried out at the Board's Veterinary laboratory.

Habits of Ticks.—During the last five years, ticks have been obtained for experimental observations in connection with the part they play as carriers of disease. In the course of these a considerable amount of information as to their habits was obtained, and a summary of this is given. The report deals with *Hæmaphysalis punctata,* which occurs on both cattle and sheep in this country. The life-cycle was found to be as follows:—(1) Hatching of the eggs takes place mainly in July, and, to a much less extent, in August; (2) if opportunity occurs, as it must in most cases, the larvæ become engorged almost at once, and moult to nymphæ, mainly in August and September, and to a less extent in October; (3) the nymphæ fill themselves, given a host, mainly in August, September, and October of the same year, and a considerable proportion moult to adults from September onwards; many nymphæ do not engorge or moult until the following spring; (4) the engorged females do not as a rule start laying until spring. Some may lay in February, but the majority not till May or June. Whatever be the date of laying, hatching appears only to take place after the beginning of July.

While a cycle of 95 days from engorged female to engorged female is theoretically possible, it is highly probable that in most cases the actual period is about 290 days. It is suggested that when dipping for the suppression of ticks (this, of course, does not refer to "keds," which farmers sometimes erroneously call sheep ticks) is carried out it should be done in April or May, and in October or November, as at these two periods the greatest numbers are likely to be caught engorging themselves at one time. To guard against dissemination of ticks, dipping should be carried out before moving animals from an infected country or district.

Bracken Poisoning.—In connection with so-called bracken poisoning, to which reference was made in the report for 1909, experimental feeding on bracken again failed to produce the characteristic symptoms of the disease. In one case the owner of affected cattle attributed the illness to Tormentil (*Potentilla tormentilla*, Linn.), and a heifer fed at the laboratory on this weed, taken from the pasture where illness was prevalent, became affected, and, on examination, showed all the appearances associated with the mysterious "bracken poisoning." It is pointed out, however, that there is a distinct possibility of the tormentil—which is a common weed in most parts of the country, and usually regarded as harmless—having merely acted as the carrier of some form of contagion from the pasture on which sick animals were grazing.

Origin of Thoracic Tuberculosis in Calves (*Journal of Comparative Pathology and Therapeutics, September*, 1911).—In this article, taken from the *Annales de l'Institut Pasteur*, Vol. xxv., No. 7, M. P. Chaussé describes some of the recent work carried out to compare inhalation and ingestion as means of infection in tuberculosis, and gives an account of experiments carried out by himself in this connection. Both lambs and calves were submitted to infection in the two ways. It was found that when virulent material, taken from diseased animals, was (after being diluted very considerably) sprayed into the air of the houses where animals were kept, tuberculosis of the lungs was contracted in every case. The disease was not so easily produced by *feeding* animals with the infective material, and from this, taken along with the results of his examination of the carcasses of a large number of young calves, the writer argues that in about 90 per cent. of cases tuberculosis in calves is caused by inhalation, and in only very few is infection produced through the food.

From this, the conclusion is drawn that in children the risk of infection through consuming cows' milk is slight compared with the chances of infection through being placed in intimate contact with tuberculous people, especially in insanitary surroundings.

HORTICULTURE.

The Effect of Grass on Trees (*Thirteenth Report of the Woburn Experimental Fruit Farm, 1911*).—In their Third Report, the Duke of Bedford and Mr. Spencer U. Pickering drew attention to the extent of the damage done to young fruit trees by grass. In the report under notice an account is given of experimental work that has been carried out since then, to test further the effect of the grass and to try to obtain a satisfactory explanation of its action.

It has been found that the extent of the effect depends on certain conditions, such as character of soil, age and kind of tree, and the rate at which grass spreads over the area cleared when the tree is planted, but in all the experiments extending over sixteen years, and carried out at several centres, there was only one case in which the deleterious action of the grass was not marked. In the majority of cases it was considerable, and in many it caused the death of the tree. In none of the experiments has any recovery from the effect been noticed, except in cases where the roots have extended beyond the grassed area into cultivated ground. Ten years' records of the

trials at Ridgmont show that the value of the fruit obtained from dwarf apple-trees grown in grass was only 7 per cent. of that obtained from trees grown in cultivated ground exactly similar in all other respects. It is, however, pointed out that the majority of the trials were so planned that the effect of the grass would be exercised to a maximum extent—the trees were young, and the grass did not spread gradually over the ground, but seed was sown (or turf replaced) immediately after the tree had been planted. Where the grassing over proceeds gradually, the trees apparently accommodate themselves to the altering conditions, and suffer much less than when the grass is actually sown over their roots. The fact that a tree has become well established in the ground before the land is grassed does not, however, prevent it suffering.

Standards on the free stock and dwarfs on the paradise were almost equally affected, though some varieties of apple were less affected than others, owing, doubtless, to their vigour of growth. Pears, plums, and cherries were also affected, though in the case of these trees the standards suffered less than the dwarfs.

One of the most striking facts is that the action became noticeable as soon as any of the roots of the tree had entered a grassed area, no matter how small was the proportion of such roots to the whole root system of the tree.

It is suggested that in some soils, where the effect produced is not great, grass might be advantageous from a commercial point of view, for the check given to growth tends to increase the cropping, and grass affects the colouring matter of all parts of the tree, generally resulting in a high colouring of the fruit.

Forest trees appeared to be affected by grass in the same way as fruit trees when grass was sown immediately after planting, though in the case of conifers on a light soil the effect was much less than with other trees, and some recovery gradually took place.

Explanation of the Effect.—The most commonly accepted explanation is that the tree roots suffer from the competition of the strong and widely searching grass roots, in obtaining moisture and plant food, particularly the former. The writers of the report are, however, unable to accept this solution, and give full accounts of experiments designed to test it.

Their findings and arguments may be summarised as follows:—

1. The effect of grass is pronounced in wet seasons as well as in dry ones.

2. Trees which are affected show none of the characteristic signs of suffering from drought; and, in fact, in a time of drought the grass shows the effect much sooner than the trees.

3. The difference between the foliage of trees grown on cultivated soils and that of those grown on grass is most marked in autumn and spring, when there is plenty of moisture in the soil.

4. Determinations of the water content of soils, in which trees were suffering from the effect of grass, did not show lack of moisture as compared with cultivated soils; in fact, rather the reverse.

5. Affected trees artificially watered still continued to show the effect of the grass, even when the grass roots were prevented from coming into contact with those of the tree.

6. Extra manuring to affected trees did not do away with the effect of grass, which also was just as marked when the crop was grazed by goats as when mown and left on the surface, as was ordinarily done.

The effect of aeration of the soil was also insufficient to account for the better thriving of the trees grown on cultivated soil, and in the same way there was no evidence to suggest an alteration in the physical condition of the soil or a change in the character of the soil bacteria sufficient to account for the effect.

Partly as a result of experiments designed to test the point directly, and also partly as a result of eliminating all other possible explanations, the authors conclude that in the growth of the grass a substance toxic to the roots of trees is formed. This substance, however, easily oxidises, and if the grass is killed or removed, the trees soon recover from its effect, and are actually benefited by grass leachings in cases where these have been exposed to air.

LIVE STOCK AND FEEDING STUFFS.

Feeding Experiments with Cattle and Sheep (*Northumberland C.C. Educ. Com., Bull.* 17, *Cockle Park Expt. Sta.*).—This bulletin gives accounts of several different feeding experiments carried out at Cockle Park in 1910–11. The results may be summarised in the following form:—

1. *Testing of Feeding Standards.*—Two lots of cattle were fed on rations exactly the same, except that one received 6 lb. soya cake (or decorticated cotton cake) per head per diem, while the other lot were given 4 lb. of soya cake (or decorticated cotton cake) and 2 lb. Bombay cotton cake. The latter, along with 80 lb. swedes, 8 lb. meadow hay, and 8 lb. oat straw, per 1,000 lb. live weight of the animal, corresponded to the Wolff-Lehmann standard, while the former provided a larger proportion of digestible albuminoids.

The cattle receiving the richer ration increased during the four months' experimental period at a rate of $13\frac{3}{4}$ lb. per head weekly, as compared with $13\frac{1}{4}$ lb. in the case of the other lot. Owing, however, to the greater cost of the former ration the cattle were fed on it at a slight loss, while the others on the cheaper ration, with less albuminoids, gave a slight profit.

2. *Comparison of Decorticated Cotton Cake and Soya Cake.*—The analyses of the two cakes were very similar, but the cost of the cotton cake was £8 10*s*. per ton, against £6 12*s*. 6*d*. for the soya cake.

When tried with two lots of fattening bullocks the average gain per head in the lot receiving decorticated cotton cake was 14 lb. weekly, while in the lot receiving soya cake it was 13 lb. The greater cost of the former food, however, more than neutralised this difference, and while the use of soya cake resulted in a gain of 2*s*. 8*d*. per head, decorticated cotton cake gave a loss of 2*s*. 6*d*. per head. This confirms the results of previous trials, which have shown "that these two cakes have a very similar value for feeding purposes."

With stirks six months old the financial returns were slightly in favour of the decorticated cotton cake.

3. *Feeding Sheep without Swedes.*—In this experiment "three-parts

bred" hoggs were fed indoors in two lots, one receiving a ration containing 10 lb. swedes a day, while in the other swedes were replaced by $\frac{7}{8}$ lb. maize meal and 1 lb. oat straw. The lot receiving swedes increased at the rate of 1·06 lb. per head weekly, the others at the rate of 1·22 lb. Owing, however, to the greater cost of the second ration, the financial results were practically the same for the two lots.

4. *The Feeding Value of Digestible Albuminoids and Amides.*—From an experiment designed to test the feeding value of amides, it is concluded that the flesh-forming value of amides is negligible, but that for all practical purposes the digestible total albuminoids (which includes amides) may be taken in calculating rations.

DAIRYING.

Milking Machine Trials (*Midland Agric. and Dairy Coll., Bull.* 1, *1911–12).*—In 1909 and 1911 trials with a well-known milking machine of the suction type were carried out to test its efficiency, to see if machine-milked cows become "dry" sooner than hand-milked ones, and to observe the effect of the system of milking on the chemical composition and on the purity, from a bacteriological point of view, of the milk.

In each year one group of cows was milked as completely as possible by machine, and then stripped by hand (it was found impossible to reduce the strippings to less than 1½ to 2 lb. from a cow yielding 20 lb. of milk); the other group was milked entirely by hand. In 1909 the average fall over a period of ten weeks in the milk yield of machine-milked cows was 26 lb. a week, as compared with 21·6 lb. a week in the case of hand-milked cows. In 1911 it was not possible to prolong the test for more than four weeks, and in this period the average weekly decline in the yield of milk given by the two groups of cows was the same.

As regards the fat content of the milk, there was practically no difference between that obtained by the two systems, though it must be remembered the cows were stripped by hand after the machine.

To test the cleanliness of the milk obtained in the two ways separate cheeses were made, and also direct bacteriological examination was carried out. In the first season, when the machine was run without special care and under conditions similar to those which would obtain on an ordinary farm, the milk was often of a bad flavour, and unless special precautions were taken in making, the resulting cheese was inferior in flavour and quality. In the second series of trials the machine was placed under the charge of a skilled person, and special measures, such as soaking the teat-cups in various solutions, were adopted to keep the important parts clean. As a result of this there was a marked improvement in the cleanliness of the milk, and cheeses with a better flavour than before were obtained.

It was found that the number of bacteria in machine-drawn milk was greater than in the hand-drawn milk. A curious feature of the machine-drawn milk was that, though it contained sometimes as many as ten times the number of bacteria in hand-drawn milk, it took longer to ripen. It is pointed out that the total number of bacteria present in milk was not by itself a reliable guide, as many of the organisms had no action on milk.

The chief disadvantages of the machine appeared to be the great difficulty of keeping various parts of the machine in a suitably clean state, and the apparent impossibility of preventing the teat-cups falling off during the milking, with resulting loss of time and contamination of the milk.

MISCELLANEOUS.

The Food of the Starling (*Second Report on Economic Biology, by W. E. Collinge,* 1912).—146 starlings were shot in the vicinity of Birmingham from January to June, 1911, and the contents of their stomachs examined. Details of the results are given, from which it is clear that the food of the birds had been of a distinctly insectivorous nature, and in hardly a single case was there any grain or other farm or garden crops. It is, however, pointed out that the results might have been different if the birds had been shot in a purely agricultural district, and that in order to make the investigation complete, it should have been continued over the whole year, when information as to the extent to which starlings inflict loss on fruit-growers would have been obtained.

OFFICIAL NOTICES AND CIRCULARS.

Advisory Committee on the Development of Forestry.

The Right Hon. Walter Runciman, M.P., President of the Board of Agriculture and Fisheries, has appointed a Committee to advise the Board on matters relating to the development of forestry. References will be made to the Committee from time to time as occasion arises. The Committee will be asked in the first instance :—

(1) To consider and advise upon proposals for a Forestry Survey;

(2) To draw up plans for experiments in sylviculture, and to report upon questions relating to the selection and laying out of forestal demonstration areas;

(3) To advise as to the provision required for the instruction of woodmen.

The Committee is constituted as follows: Sir Stafford Howard, K.C.B. (Chairman); Mr. F. D. Williams-Drummond; Sir S. Eardley-Wilmot, K.C.I.E.; The Right Hon. R. C. Munro-Ferguson, M.P.; Lieut.-Col. D. Prain, C.M.G., C.I.E., F.R.S.; Mr. E. R. Pratt, President of the Royal English Arboricultural Society; Professor Sir W. Schlich, K.C.I.E., F.R.S.; Professor Wm. Somerville, D.Sc.; The Hon. Arthur L. Stanley.

Mr. R. L. Robinson, of the Board of Agriculture and Fisheries, will act as Secretary.

Departmental Committee on Buildings for Small Holdings.

The Right Hon. Walter Runciman, M.P., President of the Board of Agriculture and Fisheries, has appointed a Departmental Committee to inquire and report as to the probable duration of the various classes and descriptions of buildings and other works required for the equipment and adaptation of land for small holdings in the various districts of England and Wales.

The Committee is constituted as follows :—The Hon. E. G. Strutt (Chairman); Mr. M. T. Baines, Senior Small Holdings Commis-

sioner; Mr. A. Barker; Mr. H. H. Law, M.Inst.C.E., Deputy-Chief Engineering Inspector of the Local Government Board; Mr. W. H. Ralston.

Mr. S. Samson, of the Board of Agriculture and Fisheries, will act as Secretary.

Departmental Committee on Small Holdings (Cheaper Buildings).

The Right Hon. Walter Runciman, M.P., President of the Board of Agriculture and Fisheries, has appointed a Departmental Committee:—

1. To inquire and report as to the nature and character of the buildings which should be provided for use in connection with small agricultural holdings in England and Wales, regard being had:—

(*a*) To the convenience and requirements of the occupiers.

(*b*) To considerations of economy, and also the possibility of the reduction of cost by the use of materials and methods of construction different from those ordinarily employed at present;

(*c*) To the special agricultural and building conditions of the different parts of the country; and

(*d*) To the various requirements of the Public Health Acts, and any Orders or Regulations made thereunder.

2. To submit a series of plans and specifications likely to be of assistance to local authorities and landowners for the purpose.

The Committee is constituted as follows:—Mr. Christopher Turnor (Chairman); Mr. Colin Campbell; Mr. E. J. Cheney, an Assistant Secretary to the Board of Agriculture and Fisheries; Mr. F. R. Harding-Newman; Mr. Cecil Harmsworth, M.P.; Mr. A. Ainsworth Hunt, M.S.A.; Mr. H. H. Law, M.Inst.C.E., Deputy-Chief Engineering Inspector of the Local Government Board; Mr. Henry T. Tate; Mr. Raymond Unwin.

Mr. C. W. Sabin, of the Board of Agriculture and Fisheries, will act as Secretary.

Committee on Mountain and Moorland Breeds of Ponies.

The following gentlemen have consented, on the invitation of the President of the Board of Agriculture and Fisheries, to act as a Committee to advise him as to whether, and, if so, what measures can be adopted for the improvement of mountain and moorland breeds of ponies:—

Lord Arthur Cecil; Mr. C. Coltman Rogers, Mr. T. F. Dale, Mr. A. C. Mardon, and Mr. E. P. Worthey.

Mr. A. B. Charlton, of the Hunters' Improvement Society, will act as Secretary.

American Gooseberry Mildew Notice Forms.

The Board of Agriculture and Fisheries have made arrangements with the Controller of his Majesty's Stationery Office whereby books containing one hundred of either Form $A\frac{150}{1}$ declaring certain premises to be "infected premises," or Form $A\frac{151}{1}$ requiring the occupier of infected premises to take steps to remove visible traces of disease, can be obtained by Local Authorities

for the use of inspectors under the Destructive Insects and Pests Acts, 1877 and 1907, in connection with the administration of the American Gooseberry Mildew Order, 1911.

The price of the books is one shilling, post free. Applications for them should be addressed to Messrs. A. and E. Walter, Ltd., of 13–17, Tabernacle Street, London, E.C.

The Board trust that Local Authorities will find it convenient to use these books so as to secure uniformity of practice.

Tomato and Cucumber Canker.

The Board of Agriculture and Fisheries desire to warn all growers of tomatoes that the disease known as Tomato and Cucumber Canker (*Mycosphærella citrullina*) is included among the diseases which, in pursuance of the Destructive Insects and Pests Order of 1910, must be reported to the Board by the occupier of any premises on which they appear. A description of the disease is given in the Board's leaflet, No. 230, copies of which can be obtained free of charge, and post free, on application to The Secretary, Board of Agriculture and Fisheries, 4, Whitehall Place, London, S.W. Letters so addressed need not be stamped.

Growers who are in doubt as to whether or not the disease is present on their premises should submit specimens of affected plants to the Board for determination.

Up to the present the disease has been chiefly confined to tomatoes grown under glass. Occupiers of premises on which the disease appeared last year are strongly advised not to plant tomatoes in the same soil, unless it has been adequately sterilised, and to spray all their plants during the early part of the season with Bordeaux mixture or a solution of liver of sulphur (one pound to 32 gallons of water).

Re-Allocation of Duties of H.M. Commissioners of Woods.

As announced in reply to a question asked in the House of Commons on February 20th, 1912, Sir E. Stafford Howard has tendered his resignation of the office of one of the Commissioners of His Majesty's Woods and Forests. His resignation will take effect as from March 31st next. No new appointment of a Commissioner will be made to fill the office he vacates, and there will be a fresh allocation of the Commissioners' duties between the two remaining Commissioners, Mr. Runciman, the President of the Board of Agriculture and Fisheries, and Mr. G. G. Leveson-Gower. The supervision of the Crown Forests other than Windsor and of the more important Crown Woods will now be committed to Mr. Runciman, with the object of bringing their administration into closer co-operation than has hitherto been possible with the work of the Board in regard to the development of sylviculture and forestry.

Importation of Animals, Hay and Straw into Ireland *from Great Britain*.

The Board of Agriculture and Fisheries gave notice on February 13th last that the Department of Agriculture and Technical Instruction for Ireland had decided in view of the satisfactory position of Great Britain in regard to Foot-and-Mouth Disease, that (1) importations into Ireland of ruminant animals and swine could be again allowed from any part of Great Britain, subject to the ordinary conditions applying in such cases; and (2) the restrictions on landing in Ireland of British-grown hay and straw need not further be maintained.

The Orders prohibiting the landing in Ireland of hay and straw from foreign countries in which Foot-and-Mouth Disease exists continue in force.

Produce of Crops in Great Britain.

Part II. of the Agricultural Statistics for 1911 [Cd. 6056, price 4½*d.*] has recently been issued by the Board, and contains the returns as to the yields of crops in Great Britain in 1911, compiled from the estimates furnished by the Board's Crop Reporters, together with summaries for the United Kingdom. Preliminary statements showing the estimated average yield per acre and total production of the various crops were issued for hops on October 12th; for corn, pulse, and hay on November 3rd; and for potatoes and roots on November 29th, 1911.

MISCELLANEOUS NOTES.

Notes on Agriculture Abroad.

Importation of Australian Mutton into Germany.—H.M. Vice-Consul at Leipzig (Mr. Turner) reports that, in connection with the high price of meat in Germany, the Butchers' Guild of Chemnitz recently made the experiment of importing a quantity of Australian mutton. A demonstration of the manner of cooking the mutton was given, and the meat was subsequently disposed of to the public at prices ranging from 75 pfennigs (9*d.*) to 65 pfennigs (8*d.*) a pound. It is believed that this experiment is the first of its kind in Germany. Should it seem likely that Australian meat could be satisfactorily disposed of in Germany, British houses interested in the industry might find it to their advantage to turn their attention to this market.

H.M. Vice-Consul is of opinion that opposition would probably be met with from the agricultural interests, and that difficulties would also be encountered both in accustoming the population to the use of frozen meat and in the provision of suitable storage facilities, especially during the summer months.

Potato Drying in Germany.—The problem of the proper utilisation of the surplus potato crop in Germany has been to some extent solved in recent years by the introduction of satisfactory methods of potato drying. In 1908 the total potato crop of Germany amounted to 915 million cwt., and of this it is estimated that about 256 million cwt. were used for

human consumption, 79 million cwt. in the starch and alcohol industries, 108 million cwt. for seed, and 374 million cwt. for feeding animals, leaving a surplus of 98 million cwt., valued at £6,000,000. The actual amount of the surplus naturally varies from year to year, according to the size of the crop, but the fact that the alcohol and starch factories had apparently reached their maximum production made it very necessary to find some profitable outlet for the surplus in order to avoid a decrease in the acreage. A further impulse was given to the potato drying industry in 1909 by the increased taxation of brandy, which, it is estimated, decreased the consumption of this spirit by 22 million gallons per annum.

Many systems of drying potatoes have been invented suitable for the manufacturer as well as the small farmer, but the methods generally in use produce either dried potato slices (*Kartoffelschnitzel* or *Kartoffelscheiben*) or dried potato flakes (*Kartoffelflocken*).

Experiments with these dried potato foods (see *Journal*, July, 1911, p. 332) have shown that they form an excellent feeding stuff for all kinds of stock, and may with advantage be used in preference to raw potatoes when the latter have sprouted or are otherwise of inferior quality. The price of these potato flakes is stated to be about 7*s*. or 8*s*. per cwt.

The following particulars relating to the statistics of potato drying in Germany are given in the *Mitt. der Fachberichterstatter des K.K. Ackerbauministeriums* (Austria) No. 1, 1912:—

There were on July 1st, 1910, 257 potato-drying factories in Germany; 65 were owned co-operatively or by companies; steam drying apparatus was in use in 209 factories, and hot air in 45. Unskinned potatoes were mostly used, peeled potatoes forming the raw material of only eight factories.

During the year 6,546,000 cwt. of potatoes were dealt with. The dry products amounted to 1,723,000 cwt., including flakes 1,374,000 cwt., and slices 314,000 cwt. The total production in 1909–10 was almost double that of 1908–9. The industry is said to have had a steadying influence on prices by giving farmers an alternative market.

Estimated Export of Siberian Butter in 1912.—A memorandum by Mr. Cooke, Commercial Attaché to H.M. Embassy at St. Petersburg, states that, according to the official *Commercial Gazette* of St. Petersburg of February 14th, the export of butter from Siberia in 1912, as estimated by the Conference of Exporters meeting at Omsk on January 28th and 29th, will be about 72,400 tons, or 5 per cent. increase over the export in 1911. It is also estimated that about 82 per cent. of this total will be exported during the summer season.

Dry Farming in Russia.—The following account of dry farming as practised in Russia is taken from the report of H.M. Vice-Consul at Kharkoff:—

Large tracts of fertile soil in Russia lie in a semi-arid zone, where the rainfall between spring sowing and harvest is very small, and the excessive heat and winds rapidly dry the soil. The proper development of the grain largely depends upon the possibility of retaining the moisture in the soil or of drawing upon the reserve of water below the surface.

A method in use in the United States (named after its inventor, Professor Campbell) is being largely adopted in such districts. It consists in deep (say 10 in. or more) ploughing, in pressing down the lower surface of the furrow by means of a special type of wheeled roller or "subsoil packer" to increase the capillary action from the damp earth towards the roots of the grain. Both immediately after ploughing, and as long as possible after sowing, the surface is kept in a pulverised state by means of harrows and cultivators, so as to stop the capillary action near the surface and thus to retard evaporation. The grain is sown in rows, about 7 in. apart, so as to facilitate the cultivation of the soil between the rows during the early part of the summer. Sometimes the rows are sown in narrow, 4-in. pairs, with 14 in. space between the pairs, for cultivation. Much less seed grain is thus used, and the grain is stronger and more abundant than with the usual method of sowing, and well repays the extra labour. Special machines for this system of cultivation are finding an increasing sale.

A simplified method more easily carried out by the poorer peasants, if the five years' rotation of crops is adopted, is the ploughing down of the stubble immediately after the harvest, or in early spring, and of keeping the fallow "black," viz., with pulverised surface and free of weeds. Stubble gives the necessary grazing land, but favours the growth of weeds and withdraws moisture and strength from the soil. For keeping a "black" fallow the peasants must, therefore, provide special land for sowing green fodder, which is possible in the five years' rotation of crops.

Another method, that has, however, not generally given satisfactory results, has been developed by Mr. Demtschinsky. He adopts the Chinese practice of transplanting the young grain and setting it deeper into the soil in order to get two or three successive rows of roots to develop out of the knots in the stem. In test cultures the results are stupendous, each seed producing a bush-like bunch of stems and widespread strong roots; but in practice, where instead of setting the plants deeper the earth is heaped on to the young stems, it is generally found that the work is ill spent. Special sowing machines are manufactured for this method of planting, but they have rarely been used, and only for experimental purposes. (*F.O. Repts., Annual Series,* No. 4781.)

Improvement of Agriculture in Russia.—Reports by H.M. Vice-Consuls at Nicolaiev and Kharkoff (*F.O. Reports, Annual Series,* No. 4781) call attention to the improvement of agriculture in Russia, which is resulting from the policy of the Russian Government in regard to land.

As a consequence of the new land policy, commenced in 1906, large areas of land have passed, and will continue to pass, into the hands of peasant proprietors. To this end financial aid on easy terms is given by the Peasant Land Bank. A further step in this policy is the alteration from the old system of tenure amongst the peasants, namely, that of tenure in common with a triennial redistribution of the communal land. A peasant can now hold his land in perpetuity, to the encouragement of better cultivation. Under the former system of common tenure the insecurity of tenure discouraged the peasants from any attempt at intensive cultivation. Another evil incident to the old system was the waste of time caused by all the peasants of a commune

living in one village. The villages were in consequence large, and the distances between them very great and devoid of dwellings. For those peasants whose holdings were situated at a distance from the village the time thus wasted in going to and from their work was enormous.

This drawback is now disappearing, and the face of the country is gradually undergoing a change. With the peasant secured in his tenure, he is beginning to live on his holding, and between the large parent villages houses may now be seen dotted over the steppe. Thus not only is time economised, but also, with the owner on the spot, more constant care is possible, and the subsidiary occupations of a farm life are to a much greater degree open to the wife and family.

The advantages of this change are obvious, and its effects, in conjunction with those of the institution of the small proprietors created with the aid of the land hanks, far reaching.

Another factor in the new policy is the existence of a body of agricultural experts, stationed throughout the country under the supervision of the Zemstvos—the equivalent of our county councils—to advise and counsel the peasants and farmer on all matters of cultivation. The Zemstvos also maintain experimental farms where the peasants see the concrete results of better farming and of better seed grain. Seed is now sold hy the Zemstvos where formerly the peasants used their own inferior grain for seed. Seed-cleaning and sorting machines are supplied to villages on hire. Lectures, frequently with limelight pictures, teach peasants how to increase the yield of their farms, show them the advantages of the five years' rotation of crops instead of the wasteful three years' rotation of winter grain, oats, and fallow, and teach them the use of better types of implements and the proper cultivation of the soil.

Government aid is also given in the shape of credits furnished to groups of peasants, on the joint responsibility of the group. Amongst the functions of these small credit associations is the advancing of cash against grain, for the purchase of implements, seed grain, and other requisites. These credit associations are gradually extending the scope of their functions, and in many villages stores have been opened. At these stores all the requisites of a peasant's existence can be procured, so that he is now no longer obliged to go into the towns for every small purchase.

The Imperial Bank has of late also adopted a new policy, and now participates actively in the realisation of the crops. Advances on grain are granted at 4½ per cent., which is for Russia an extremely low rate. A question at present being considered by the bank is the establishment of granaries at various centres. One effect of this new policy of the Imperial Bank, in so far as it regards the advances on grain, has been to make the Russian peasant a speculator on the world's grain market. Placed in a position of being able to obtain cash advances on his grain at 4½ per cent., the peasant frequently refuses to sell except at his own price. To what extent he will prove himself a wise speculator is a moot question. Much will depend on his ability to take a comprehensive survey of the world's supply and demand.

In this connection mention should not be omitted of the greater knowledge possessed now by the peasant of the world's daily prices,

to which the extension of the telegraphic system has greatly contributed. Another step in this direction was taken by the Government during the past year, when it was decided to post up every few days in all railway stations and public places frequented by peasants an official list of the prices prevailing for grain at the various large centres.

Notes on the Weather in February.

The weather during the *first* week of February (January 28th to February 3rd) was very wintry, but snow was seldom experienced except in the north-east and north of Britain. Temperature was much below the average, the deficit amounting to 10° in the south-west of England and the midland counties, and to about 9° in several other parts of Britain. Rainfall was as a rule "very light," but "moderate" falls were recorded in England E. and N.E., and Scotland E. An abundance of bright sunshine was experienced during the week all over the country.

At the beginning of the *second* week the general condition was again very wintry, and snow showers were experienced in almost all districts. After Monday in this week, however, a thaw extended over the country from the southward, the air became humid, and rain alternating with occasional bright intervals was experienced everywhere. Over the whole week temperature was below the average, but rainfall did not differ greatly from the normal. Bright sunshine was less than the average, except in Scotland N. and England N.W.

Throughout the *third* week, the sky as a general rule was either very cloudy or entirely overcast, while on several days small or moderate amounts of rain were experienced. "Unusual" warmth was experienced in England E., S.E., N.W., and the midland counties, and "moderate" warmth elsewhere. Rainfall was "moderate," and sunshine either "scanty" or "very scanty," except in Scotland N.

The weather throughout the *fourth* week was again very cloudy or overcast, while on most days there was more or less rain. Warmth was everywhere "unusual," the excess above the average being as much as 7° in England E. and the midland counties. Rainfall was more than the average in all districts except England N.W., the excess being very considerable in the west and north. Sunshine as a rule was "scanty" or "very scanty," but was "moderate" in England N.W. and N.E., and Scotland W.

The general condition continued very unsettled in the *fifth* week (February 25th to March 2nd), and slight or moderate falls of rain occurred on most days. In the extreme north and north-west, however, the rain was sometimes heavy locally. In the eastern districts of England and Scotland the falls were either "moderate" or "light." "Very unusual" temperature was recorded everywhere, the excess above the average amounting to 10° in the east of England. Bright sunshine was less than the normal in all districts.

Agricultural Conditions in Great Britain in February.

The Crop Reporters of the Board, in reporting on agricultural conditions during February, state that the mild, though generally wet, weather that prevailed after the first few days of the month, has been favourable to the winter crops, which are mostly looking vigorous and are well forward. The severe frosts during the first week, however, appear to have done damage in some districts, notably in the midlands, where both winter oats and beans suffered. A few cases are also mentioned where some re-sowing will have to be done owing to low-lying land having been flooded.

The rather persistent wet weather has nearly everywhere kept the land in a moist condition, and comparatively little progress has accordingly been made with spring sowings.

The lambing reports are not quite so unsatisfactory as last month, and it would appear that the earliest flocks have given the poorest results. In the midland and eastern counties, so far as lambing has taken place, the fall is, upon the whole, not more than average, but reports state that the lambs are healthy and more numerous than was the case last month, though cases of loss are frequently mentioned. Towards the north of England, where lambing had only just begun, reports are better; but in Scotland the very few lambings reported have been disappointing.

In certain districts sheep have suffered somewhat from the sharp weather in the early part of February, and losses of hoggs are recorded from the midlands; but stock began to show improvement towards the end of the month, although they are generally bare of flesh and backward in condition. The mild weather has allowed of their being turned out, and a further saving of the scanty stores of roots has consequently been effected. Turnips which had not been stored were in many cases damaged by the frosts at the beginning of the month.

Notes on Crop Prospects Abroad.

The *Bulletin of Agricultural Statistics* for February, 1912, issued by the International Institute of Agriculture, shows that, after the inclusion of the latest harvest figures for Norway, Sweden, and Canada, which were published in the January bulletin, the total production of *wheat* in 1911 for the following countries in the northern hemisphere:—*Europe (excluding Portugal and countries south of the Danube other than Bulgaria); Canada, the United States; India, Japan, Asiatic Russia; Algeria, Egypt, and Tunis,* amounts to 394,184,000 qr., as compared with 398,084,000 qr. in the previous year, a reduction of 1 per cent.

If to this total be added the production in the four countries of the southern hemisphere, *Argentina, Chili, Australia, and New Zealand,* for which figures are available, the total production amounts to 430,547,000 qr., as compared with 432,551,000 qr. in the previous year, or a reduction of ½ per cent.

Sowing of Winter Cereals.—The areas estimated to have been sown with *wheat* up to December 31st, 1911, compared with the areas sown during the corresponding period of 1910, expressed as percentages, are shown for the following countries, in addition to those

for which similar information was published in the previous month:— Hungary (not including Croatia and Slavonia) 106; Croatia and Slavonia, 105; Roumania, 104·1; Japan, 102. The areas sown with *rye* are for Hungary, including Croatia and Slavonia, 102; Roumania, 87·7. The areas sown with *barley* are for Hungary, 103; Croatia and Slavonia, 104; Roumania, 73·9; and Japan, 99.

In Europe generally the condition of the winter corn was very good. An excess of rain has caused some damage to cereal crops in the north of *Italy*, while in some other parts of that country development has been retarded by lack of moisture. Very cold weather prevailed at the close of January and in the first part of February in several countries, and in *Sweden* the winter has been extremely cold, but no harm appears to have been done to the crops. In *Canada* intense cold was prevailing on February 1st, but the crops should not suffer, having a good covering of snow. The condition of winter wheat in *Japan* is reported at about average. Winter crops generally in *Tunis* are in good condition, while in *Egypt* the condition of barley seedlings is reported as good and of wheat average.

India.—The second official crop report for the United Provinces states that wheat prospects are uniformly favourable, and if the crop escapes rust, which has appeared in places, an excellent harvest is assured. The second official report for the Province of Bengal estimates the wheat area at 1,340,000 acres, compared with 1,382,000 last year. District officers estimate the yield at 97 per cent. of normal, but in view of the favourable weather, the out-turn is expected to be normal.—(*Broomhall's Corn Trade News*, March 4th and 6th.)

United States.—The *Cincinnati Price Current*, in its weekly report, states that the wheat crop, with few exceptions, is maintaining the promising outlook. The position in the west and south-west is favourable, particularly in Kansas.—(*Dornbusch*, March 8th.)

Prevalence of Animal Diseases on the Continent.

The following statement shows that, according to the information in the possession of the Board on March 1st, 1912, certain diseases of animals existed in the countries specified:—

Austria (for the period February 14th—21st).

Anthrax, Blackleg, Foot-and-Mouth Disease (total of 2,115 Höfe now infected), Glanders and Farcy, Rabies, Sheep-scab, Swine Erysipelas, Swine Fever, Tuberculosis.

Belgium (for the period January 16th—31st).

Anthrax, Blackleg, Foot-and-Mouth Disease (62 "foyers" in 49 "communes"), Rabies, Sheep-scab.

Bulgaria (for the period January 29th—February 6th).

Anthrax, Glanders and Farcy, Rabies, Sheep-pox, Sheep-scab, Swine Fever.

Denmark (month of January).

Anthrax, Foot-and-Mouth Disease (251 cases), Swine Erysipelas.

France (month of December).

Anthrax, Blackleg, Foot-and-Mouth Disease (5,954 "étables" in 2,110 "communes"), Glanders and Farcy, Rabies, Sheep-pox, Sheep-scab, Swine Erysipelas, Swine Fever.

Germany (for the period February 1st—15th).
Foot-and-Mouth Disease (4,790 infected places in 2,076 parishes), Glanders and Farcy, Swine Fever.

Holland (month of January).
Anthrax, Foot-and-Mouth Disease (75 outbreaks in 11 provinces), Foot-rot, Rabies, Swine Erysipelas.

Hungary (for the period February 7th—14th).
Anthrax, Foot-and-Mouth Disease (total of 111 "cours" now infected), Glanders and Farcy, Rabies, Sheep-pox, Sheep-scab, Swine Erysipelas, Swine Fever.

Italy (for the period January 15th—21st).
Anthrax, Blackleg, Foot-and-Mouth Disease (117 new cases entailing 2,941 animals), Glanders and Farcy, Sheep-scab, Swine Fever.

Montenegro (for the period January 1st—15th).
Foot-and-Mouth Disease (20 "étables" infected in 8 "communes").

Norway (month of January).
Anthrax, Blackleg, Swine Fever.

Roumania (for the period January 29th—February 5th).
Pleuro-pneumonia, Rabies, Sheep-pox, Swine Erysipelas, Swine Fever.

Russia (month of October).
Anthrax, Foot-and-Mouth Disease (121,266 animals in 2,446 "communes"), Glanders and Farcy, Pleuro-pneumonia, Rabies, Sheep-pox, Swine Erysipelas, Swine Fever.

Servia (for the period January 27th—February 3rd).
Foot-and-Mouth Disease (50 animals in 1 "commune"), Rabies.

Spain (month of December).
Anthrax, Blackleg, Dourine, Foot-and-Mouth Disease (118,532 animals), Glanders and Farcy, Pleuro-pneumonia, Rabies, Sheep-pox, Sheep-scab, Swine Erysipelas, Tuberculosis.

Sweden (month of January).
Anthrax, Blackleg, Swine Fever.

Switzerland (for the period February 12th—18th).
Anthrax, Blackleg, Foot-and-Mouth Disease (111 "étables" entailing 1,371 animals, of which 20 "étables" were declared during the period), Swine Fever.

Agricultural Labour in England during February.

The Board of Agriculture and Fisheries have been furnished by the Board of Trade with the following report, based on returns from correspondents in various districts, on the demand for agricultural labour in February:—

Outdoor employment was somewhat interrupted by unfavourable weather during February, particularly in the early part of the month. Apart from such interruption, extra labourers, though in excess of requirements in several districts, were generally in fair demand for the time of year for such work as threshing, hedging, and ditching, carting and spreading manure. There was some scarcity of men for permanent situations in parts of the Midland and Southern and South-Western Counties.

Northern Counties.—Some time was lost by extra labourers at the beginning of the month on account of bad weather. There was otherwise, in many districts, a moderately good demand for such men to thresh, cart manure, clean ditches, and mend fences. In *Northumberland* and *Durham*, however, the demand was generally but small. Such men were in excess of the demand in the Penrith (*Cumberland*), West Ward (*Westmorland*), Bridlington, Driffield, Howden, and Sherburn (*Yorkshire*) Rural Districts. The usual Candlemas hiring fairs took place in *Cumberland*, but no general change in wages was reported in this county.

Midland Counties.—Extra men were principally employed at threshing, hedging, ditching, and spreading manure. Frost and rain hindered work somewhat in the early part of the month, but generally the demand for such men was fair for the time of year; some excess in the supply was reported in the Tamworth (*Staffordshire*), Evesham, Shipston-on-Stour, and Upton-on-Severn (*Worcestershire*), and Buckingham Rural Districts. Some scarcity of men for permanent situations was reported in the Leek, Lichfield, and Uttoxeter (*Staffordshire*), Banbury (*Oxfordshire*), and Wing and Wycombe (*Buckinghamshire*) Rural Districts.

Eastern Counties.—There was, on the whole, a fairly good demand for extra labourers in these counties. With the exception of a few days at the beginning of the month, but little time was lost by such men through bad weather. The demand was again reported as adversely affected by the failure of the root crops in *Norfolk* and *Suffolk*. There was some surplus in the supply of such men in the Downham (*Norfolk*), and Cosford, Mutford and Lothingland, and Thingoe (*Suffolk*) Rural Districts. The supply was said to be somewhat short in the Chesterton (*Cambridgeshire*) and Orsett and Rochford (*Essex*) Rural Districts. No general change in wages was reported at the Candlemas hiring fairs held in *Lincolnshire*.

Southern and South-Western Counties.—Rain or frost caused some irregularity in the employment of extra labourers in most districts. When the weather permitted, there was generally a fair demand for these men for such work as threshing, hedging, ditching, and manuring land. There was a plentiful supply of such men, and some excess was reported in the Elham (*Kent*), Epsom and Farnham (*Surrey*), Hartley Wintney (*Hampshire*), and the Cricklade and Wootton Bassett and Devizes (*Wiltshire*) Rural Districts. A scarcity of men for permanent situations was reported in several districts, including the Godstone (*Surrey*), Petworth (*Sussex*), Blandford (*Dorset*), Dursley, and Stow-on-the-Wold (*Gloucestershire*), Axminster and Kingsbridge (*Devon*), and Truro (*Cornwall*) Rural Districts.

THE CORN MARKETS IN FEBRUARY.

C. KAINS-JACKSON.

Wheat.—The month of February saw the advancing tendency in wheat first emphasised, and increased by severe cold, then arrested by a change to springlike weather, and finally converted into a movement more or less in buyers' favour. The period has been one of

"weather markets" throughout. This has been due to the statistical situation not being especially helpful either to purchaser or vendor. In such a case the weather may be said to exercise a casting vote. The shipping countries have been watched with much interest, but the indication obtained from this source has been indefinite.

Argentina, for example, only shipped 621,000 qr., against 1,250,000 qr. and 1,328,000 qr. in the two preceding Februarys, but then the railway strikes kept back up-country supplies during three weeks, and the export of 330,000 qr. in the first week of resumed traffic to the coast argued that but for a non-agricultural element of disturbance the month's exports would have fully equalled the figures of 1911 and 1910. The small shipments from Russia, 412,000 qr., were balanced by North America shipping 769,000 qr., against 390,000 qr. in February, 1911, while if India had been expected to ship more than 307,000 qr., Australia had not been credited with ability to send off 705,000 qr. out of a crop which the International Institute had warned us not to regard as an average one. Europe S.E. for February shipped 538,000 qr., but only 65,000 qr. of this total is covered by British bills of lading. When Europe S.E. ships heavily in any given month, but almost exclusively to ports other than British, the effect is apt to be registered on our markets a full month later in the form of increased pressure to sell to Great Britain on the part of Argentina, the United States, and India, countries which, but for the shipments from South-Eastern Europe, would have had outlets in France, Italy, Spain, and the Low Countries. By reason of contiguity, Germany continues mainly to buy of Russia, and Australia from the very beginning has practically relied upon placing her entire wheat surplus with British buyers. One reason for this is to be found in the strong likeness between British and Australian wheat in loaf-making.

With February 29th ended the first half of the cereal year, for which the total wheat shipments were found to be, from North America, 6,247,000 qr.; from South America, 1,956,000 qr.; from Russia, 5,044,000 qr.; from Europe S.E., 5,539,000 qr. (Europe S.E. surpassing Russia is remarkable); from India, 2,191,000 qr.; from Australasia, 2,893,000 qr.; in all, 23,870,000 qr. This total is below the average.

The British wheat average for February showed some advance on January, reaction in wheat prices towards the close of the month being mainly in La Plata, Australian, and ordinary Canadian kinds. The British average for the first half of the cereal year was 33*s.* per qr. Imports and home deliveries together give a total supply in excess of the estimated requirements by over a million quarters, but the stocks in the fifteen chief ports were, at the end of February, less than usual. There are now 3,300,000 qr. of wheat on passage, a quantity virtually identical with the expectations of a year ago. February closed with ordinary Canadian wheat (type No. 4 Manitoba) at 40*s.*, with Australian at 39*s.* 6*d.*, with choice white Indian at 39*s.* 3*d.*, all per quarter. American red winter was fetching 7*s.* 10*d.* per cental.

Flour.—The month in this trade was remarkable for a rise of 2*s.* in the top-price, which had stood at 32*s.* net for some months, but rose to 33*s.* on the 12th, and to 34*s.* on the 28th. Town Households advanced from 28*s.* on January 29th to 29*s.* on February 12th, but no further advance was effected. Most of the London bakers advanced

the price of bread a halfpenny in the course of the month, but during the last half of February millers complained that bakers were buying less freely than usual. Prices made on the 28th for imported flour included 32*s*. for the finest North-Western Patents; 30*s*. for First Minnesota; 26*s*. 6*d*. for Common Kansas (made from winter wheat); 26*s*. for Australian; 25*s*. 3*d*. for Iron Duke; and 20*s*. to 21*s*. per qr. for feeding flour. The demand for this, whether the supply was from America or from France, was above the average. At the close of the month 181,000 sacks of flour were on passage. North American shipments for February were only 315,000 sacks.

Barley.—At Mark Lane's closing market for the month fine seed barley touched 39*s*. per 400 lb. corresponding to 43*s*. or 44*s*. per qr. of 448 lb. Chilian brewing made 35*s*. 6*d*. per qr. Californian was scarce and dear, and the best screened barley from Anatolia commanded 40*s*. Feeding barley declined in price after the 29th. Russian began the month at 28*s*. 9*d*. per 400 lb., and closed at 27*s*. 9*d*. Indian began at 27*s*. 0*d*. and closed at 26*s*. 6*d*. Some new crop barley for shipment from North Africa was mentioned at 25*s*. 3*d*., while Indian new crop had speculative forward buyers at a 25*s*. level. Imports for the first half of the cereal year have been a good deal above the average, but owing to the dearness of hay and straw, the scarcity of roots, and the small imports of maize, inquiry has been above the mean, and February ended with very moderate granary stocks. There are only 300,000 qr. on passage, against 680,000 qr. a year ago. February shipments were 916,000 qr. from Russia, 339,000 qr. from Europe S.E., and 120,000 qr. from India. The last item is exceptionally large.

Oats.—English oats have commanded a decidedly high price, and there have been few markets at which anything of 336 lb. weight could be bought under 22*s*. The supplies have seldom been equal to requirements of heavy oats, but the inquiry for 304 lb. sorts and for those of a thick husk has fluctuated a good deal. The Argentine oats on passage, however, declined on 28th to 18*s*., and the trade for the next two months is expected to be dominated by the efforts of La Plata to dispose of a large new crop. For March shipment the price on 29th was 17*s*. to 17*s*. 3*d*. per qr. only. Shipments of oats for February were 18,000 qr. from Canada (these oats fetch 22*s*. to 23*s*.), 480,000 qr. from Argentina, 543,000 qr. from Russia, and 50,000 qr. from Europe S.E. There are 460,000 qr., a good quantity, on passage.

Maize.—The imports of this cereal for February were below estimated requirements, and for the first half of the cereal year were estimated at one and a half to two million quarters less than current needs. The stocks are much reduced, and, as we have seen, there have been large purchases of feeding barley in lieu of maize. It is therefore curious that prices during February fell fully half a crown per quarter on Russian, a shilling on American, and on Indian two shillings. The cause is the expectation of record shipments of Argentine new crop in June and July, but the speculative market has seldom so dominated spot trade. February shipments were 705,000 qr. from North America, 403,000 qr. from Russia, 867,000 qr. from Europe S.E., and 50,000 qr. from India. There are 560,000 qr. on passage, against 495,000 qr. a year ago.

Oilseeds.—India in February shipped only 41,000 qr. of linseed, while Argentina's 203,000 qr. were much below anticipation, and on the last day of the month only 90,000 qr. were on passage to this country. Prices have therefore been but little reduced, and the best linseed cake has been costing farmers 11*s.* per cwt. This is 2*s.* per cwt. rise on the year. Lower prices are anticipated when Argentina has shipped a little more freely, and the Indian new crop is in motion. Decorticated cottonseed cake has had a brisk sale at 8*s.* 6*d.* per cwt.

Various.—Dari has been in larger demand than supply, so that 35*s.* has been about the lowest price accepted. Tares have remained as dear as ever—88*s.* per qr. for good winter. Russia has sent us a timely supply of buckwheat, which has sold well at 28*s.* per 416 lb. Beet sugar has risen to 16*s.* per cwt., and this despite augmented stocks. Rice has continued rather dear, and with only 18,000 tons on passage as compared with 32,000 tons a year previously, the feeling of holders at the close of the month was naturally confident.

THE LIVE AND DEAD MEAT TRADE IN FEBRUARY.

A. T. MATTHEWS.

Fat Cattle.—Trade in fat cattle was of a very even character. Not only was there very little change in average values from week to week, but prices varied much less than usual at the different markets. Supplies at the Metropolitan market were somewhat smaller than those of January, but maintained an average of nearly 1,000 head, the contingent from Ireland being again unusually large.. The reason for these abnormal supplies of Irish bullocks is the want of a market for them in the autumn as stores. Norfolk feeders could not purchase so many as usual owing to the scarcity of winter fodder, and therefore they had to be fed at home. They are mostly Shorthorns in very fair condition, and are making well up to 8*s.* 9*d.* per stone.

The following average prices in the leading English markets show very little change from those of January, but, with the exception of Devons, such movements as there have been have shown a slight upward tendency. Shorthorns averaged 8*s.* 9*d.* for first, and 7*s.* 10*d.* for second quality, against 8*s.* 8*d.* and 7*s.* 9*d.* per stone; Herefords, 8*s.* 11*d.* and 8*s.* 3*d.*, against 8*s.* 11*d.* and 8*s.* 3*d.*; Devons, 8*s.* 10*d.* and 8*s.*, against 9*s.* and 7*s.* 11*d.*; Welsh Runts, 8*s.* 9*d.* and 7*s.* 10*d.*, against 8*s.* 8*d.* and 7*s.* 10*d.*; and Polled Scots, 9*s.* and 8*s.* 4*d.*, against 9*s.* and 8*s.* 3*d.* per stone. The Scottish markets have been very firm, and for Shorthorns have averaged as high as those of the English. In the week ending February 22nd, Shorthorns in Scotland of first quality averaged 40*s.* 8*d.* per live cwt., against 40*s.* 4*d.* in England. It is also interesting to note that Polled Scots in the northern markets only exceeded the Shorthorn average by 1*s.* per live cwt., their average being 41*s.* 8*d.* per cwt.

Veal Calves.—These have been quoted officially in about twenty

British markets, and the trade has been of a similar character to that of January. The averages have worked out each week at 8½*d.* and 7½*d.* per lb. for first and second quality.

Fat Sheep.—The abnormal conditions ruling in the markets for sheep make it difficult to place on record the average prices realised for all classes. Thousands of tegs have been exposed in the London market alone during the past month in ordinary store condition, and have only found purchasers at extremely low prices. In fact, these have formed such a large proportion of the total supplies, that really good conditioned sheep have been difficult to find, and prices for fairly meated tegs have advanced since the middle of January as much as 1½ per lb., at any rate in the London market. On the third Monday the best small tegs freely fetched 9½*d.* per lb., and in a few extreme cases 9¾*d.*, while those weighing 80 lb. have easily made 9*d.* Many tegs have been sold at 60*s.*, and even more has been reported in the country. The scarcity of good British mutton has been long foreseen, and is likely to continue for several months. The average for first quality Downs in English markets in the third week was 8¾*d.* per lb., and 7¾*d.* for second quality, while fat ewes advanced to 6¼*d.* Longwools in the same week averaged 8¼*d.*, 7¼*d.*, and 5½*d.*, the average price of this breed in September last being 6¾*d.* for first quality. Fat lambs are coming out very sparingly, but are not meeting with a very good demand at present. Their condition, like that of the tegs, is very indifferent.

Fat Pigs.—Bacon pigs are gradually but steadily hardening in value, and averaged 6*s.* 6¼*d.* and 6*s.* per 14 lb. stone in about thirty British markets. This is an advance of 6*d.* per stone from the lowest point, which was touched in December.

Carcass Beef—British.—Scottish beef has been a very even trade throughout the month, the second being the weakest week, when prices went back 2*d.* per 8 lb. stone (the weight that is always quoted at the Central Market). The average values of the month were 4*s.* 9½*d.* and 4*s.* 7½*d.* for first and second quality short sides, and 4*s.* 6¼*d.* and 4*s.* 4*d.* for "long" or whole sides. The latter touched 4*s.* 8*d.* in the last week. English sides also made rather less than in January, their averages being 4*s.* 3¼*d.* and 4*s.* 1*d.* for first and second quality.

Port-Killed Beef.—Deptford-killed American was moderately supplied, and met a very good demand at 4*s.* 2¾*d.* and 4*s.* 1¼*d.* as the monthly average.

Chilled Beef.—After the second week there was a fall in hindquarters of Argentine chilled, but forequarters maintained January prices. The averages for the former were 3*s.* 4*d.* and 2*s.* 11½*d.* for first and second quality, and for the latter 2*s.* 4*d.* and 2*s.* 2*d.* per stone. There was no United States chilled beef worth quoting.

Frozen Beef.—The demand for frozen beef was steady, and prices showed a slight advance on those of the previous month, forequarters selling relatively well. Hindquarters made 2*s.* 7¾*d.* and 2*s.* 6*d.* as the average of first and second quality, and fores 2*s.* 0¼*d.* and 1*s.* 10¾*d.* per 8 lb. That from New Zealand fetches about 1*d.* per stone more than that from Argentina, and 2*d.* more than Australian at the present time.

Carcass Mutton—Fresh-Killed.—Fresh-killed mutton, after a long period of great depression, advanced in price in sympathy with the live-stock markets. Scotch mutton went up to 5*s.* 2*d.* per stone for prime small tegs, and 4*s.* 8*d.* for 6½ stone sheep, averaging 4*s.* 10*d.* and 4*s.* 5*d.* respectively for the month. English tegs averaged 4*s.* 3*d.* and 4*s.* for first and second quality. The advance in Scotch amounted to about 5*d.* per stone, or ⅝*d.* per lb. The season for Dutch mutton has quite closed.

British Lamb.—Circumstances have been very unfavourable for the production of early lamb, and supplies have been small, though quite sufficient for the demand, prices being about 6*s.* 8*d.* to 7*s.* 4*d.* per stone.

Frozen Mutton and Lamb.—There has been no scarcity of frozen mutton, and all descriptions have been cheap. New Zealand prime quality has remained at 2*s.* 10*d.* per stone, and Argentine and Australian at 2*s.* 4*d.* and 2*s.* 5*d.* An advance is looked for shortly in view of the higher value of fresh-killed. New Zealand lamb of the new season has met a good trade at 4*s.* to 4*s.* 4*d.* per 8 lb.

Veal.—There has been but a poor demand for veal, and the British carcasses have chiefly been of very rough quality. Prices have been much lower than in January, the average for prime English being 5*s.* 6*d.* per stone, or 8¼*d.* per lb., in Smithfield market.

Pork.—There have been full supplies of British pork at the London dead-meat markets, and trade has ruled quiet but firm at an average of 4*s.* 3*d.* and 3*s.* 10*d.* per stone.

THE PROVISION TRADE IN FEBRUARY.

HEDLEY STEVENS.

Bacon.—The chief feature of the trade in this article during February has been the steady advance in prices for long sides of all descriptions. The arrivals of this cut from Denmark have been heavier, or with the moderate arrivals from Canada, and the smaller supplies of English and Irish, prices would have been much higher. The labour unrest brought about slightly easier prices during the last few days of the month, grocers being afraid to stock a perishable article like bacon. All American meats have experienced a very small demand, and prices have favoured buyers, these remarks applying especially to hams of all descriptions.

The imports for January and February have been in excess of those for the first two months of either of the two preceding years, the increased quantity being mostly made up from Denmark and the United States of America. Although prices are high, we are several shillings below those current at the same time last year, and it is confidently expected that, with temporary setbacks, prices will advance from now onwards. The high prices of feed for the pigs in most countries are causing an advance in the cost of breeding for the curer. The arrivals of hogs on the American markets continue large, but it is generally anticipated that there will be a falling off in the quan-

tities early in March. The values of hogs at Chicago during the month ranged from \$5.80 to \$6.35, against \$6.65 to \$7.85 last year, and \$8.10 to \$9.35 two years ago.

The English curers still report a shortage in the quantity of bacon pigs obtainable, and consequently they are having to pay higher prices. These conditions are likely to become more acute as time goes on.

Cheese.—The trading throughout the month has been of a very disappointing nature, and prices show little, if any, changes. Although present values are many shillings above those current at the same time last year, it is generally expected that still higher prices will prevail during the next three months, on account of the small stocks at all points.

It is now estimated that the increase in the make of New Zealand cheese will be about 10 per cent. over last year. There is no accumulation of this description on spot, although the arrivals have been heavier. There will be practically no more cheese shipped from Canada, and there is nothing to come from the United States, the small stocks being required for home consumption.

At the end of the month the estimated stock of Canadian cheese at the three principal distributing centres (London, Liverpool, and Bristol) was 139,000 cheese, against 210,000 at the same time last year, and 221,000 two years ago. The stock of New Zealands was 16,200 crates in London and Bristol, against 32,000 at the same time last year.

The abnormally high prices of English cheese have curtailed the consumption, but holders of stock are firm, especially on high-grade lots.

Butter.—The demand has been quiet, with a tendency for prices to drop slightly, especially at the close of the month, but no doubt the somewhat restricted trade in many districts on account of the threatened coal strike has been the cause of this. It is generally anticipated that prices will remain around present levels for the next two months at least. The weather during the month has not been conducive to a good consumption, and at such extreme prices dealers naturally operate very cautiously. The most striking feature of the market has been the way in which importers have been able to make within 2*s*. of first-grade goods for all secondary quality butter, which in the ordinary course of events would be selling at from 5*s*. to 6*s*. under best.

Some of the latest advices from Australia speak of the very serious effect that the drought is having on the production in that country, especially in Queensland and New South Wales; in fact, is is reported that these two States are finding it necessary to buy their best-grade butter in Victoria. The arrivals from the Argentine, which have been fairly free, have made good prices, as the quality is reported to be very fine this year. The weather there has been very favourable for the production of butter.

Eggs.—The arrivals of foreign eggs have been extremely small; in fact, importers have at times been able to make almost any prices they cared to name, so great has been the scarcity of these cheaper grades. At the end of the month prices for English show signs of easing a little.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of February, 1912.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	ENGLAND. First Quality.	ENGLAND. Second Quality.	SCOTLAND. First Quality.	SCOTLAND. Second Quality.
FAT STOCK:—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle:—	s. d.	s. d.	s. d.	s. d.
Polled Scots	9 0	8 4	41 8	38 3
Herefords	8 11	8 3	—	—
Shorthorns	8 9	7 10	40 8	37 6
Devons	8 10	8 0	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	8½	7½	9	7
Sheep:—				
Downs	8¾	7¾	—	—
Longwools	8¼	7	—	—
Cheviots	8¾	8	8¼	7¼
Blackfaced	8¾	7¾	7¾	6¾
Cross-breds	8½	7½	8½	7½
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs:—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	6 7	6 1	6 5	5 8
Porkers	7 2	6 8	6 11	6 2
LEAN STOCK:—	per head.	per head.	per head.	per head.
Milking Cows:—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	21 10	17 10	23 7	18 8
,, —Calvers... ...	22 3	16 16	19 18	17 6
Other Breeds—In Milk ...	17 6	15 16	18 4	15 10
,, —Calvers ...	—	10 10	19 5	16 2
Calves for Rearing	2 1	1 11	2 19	2 4
Store Cattle:—				
Shorthorns—Yearlings ...	9 9	7 18	10 13	8 18
,, —Two-year-olds...	13 16	11 14	15 11	12 8
,, —Three-year-olds	17 2	15 11	16 11	14 3
Polled Scots—Two-year-olds	—	—	16 13	13 11
Herefords— ,,	14 8	12 19	—	—
Devons— ,,	14 11	13 3	—	—
Store Sheep:—				
Hoggs, Hoggets, Tegs, and Lambs—	s. d.	s. d.	s. d.	s. d.
Downs or Longwools ...	36 8	29 6	—	—
Scotch Cross-breds ...	—	—	30 5	26 0
Store Pigs:—				
8 to 10 weeks old	14 4	11 0	18 1	14 3
12 to 16 weeks old	23 0	17 0	21 6	14 4

* Estimated carcass weight.

† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of February, 1912.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	Birmingham.	Liverpool.	London.	Manchester.	Edinburgh.	Glasgow.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	59 0	58 6	59 6	56 6	59 0*	60 6*
	2nd	53 0	54 6	57 0	53 6	54 6*	58 0*
Cow and Bull ...	1st	49 6	47 6	48 0	50 0	49 6	49 6
	2nd	44 6	42 0	43 6	46 6	44 6	45 0
U.S.A. and Canadian :—							
Port Killed ...	1st	—	58 6	59 6	57 0	—	—
	2nd	—	54 6	57 6	53 6	—	47 0
Argentine Frozen—							
Hind Quarters...	1st	36 0	36 6	37 0	36 6	37 0	37 6
Fore ,, ...	1st	29 0	28 6	28 6	28 6	29 0	30 0
Argentine Chilled—							
Hind Quarters...	1st	45 6	44 0	46 0	44 6	46 0	46 0
Fore ,, ...	1st	32 0	31 6	33 0	31 6	33 6	34 0
Australian Frozen—							
Hind Quarters...	1st	35 0	34 0	37 0	34 0	—	34 6
Fore ,, ...	1st	29 6	26 0	28 0	26 0	—	28 0
VEAL :—							
British	1st	66 0	76 6	76 6	76 6	—	70 0
	2nd	56 0	68 6	66 6	69 6	—	—
Foreign	1st	—	—	76 6	—	77 0	68 6
MUTTON :—							
Scotch	1st	—	72 6	67 6	71 6	60 6	70 0
	2nd	—	68 0	62 0	67 0	52 6	53 6
English	1st	63 0	64 6	59 0	66 6	—	—
	2nd	56 6	59 0	55 6	61 6	—	—
Argentine Frozen ...	1st	34 6	34 6	33 6	34 6	35 0	33 6
Australian ,, ...	1st	32 6	32 0	32 0	32 0	—	32 6
New Zealand ,, ...	1st	—	—	40 0	—	—	—
LAMB :—							
British	1st	—	—	100 6	—	—	—
	2nd	—	—	91 0	—	—	—
New Zealand ...	1st	51 6	55 0	59 6	55 0	—	—
Australian	1st	45 6	42 0	45 0	42 0	—	40 0
Argentine	1st	42 6	42 0	41 6	42 0	42 6	40 0
PORK :—							
British	1st	59 6	61 6	59 0	61 0	55 0	57 6
	2nd	54 6	53 0	53 0	56 6	48 6	52 6
Foreign	1st	—	—	56 0	—	—	—

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1910, 1911 and 1912.

Weeks ended (*in* 1912).	WHEAT.			BARLEY.			OATS.		
	1910.	1911.	1912.	1910.	1911.	1912.	1910.	1911.	1912.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Jan. 6 ...	33 6	30 5	33 2	24 11	23 11	33 3	17 2	17 0	20 7
,, 13 ...	33 8	30 8	33 1	24 11	23 10	33 0	17 7	17 2	20 8
,, 20 ...	33 9	30 11	33 4	24 11	24 4	33 3	17 6	17 4	20 11
,, 27 ...	33 6	30 11	33 7	25 0	24 5	33 1	17 4	17 3	21 1
Feb. 3 ...	33 7	30 9	33 8	24 10	24 5	32 10	17 7	17 5	21 3
,, 10 ...	33 4	30 5	34 0	24 9	24 6	33 2	17 11	17 5	21 4
,, 17 ...	33 0	30 3	34 4	24 6	24 7	32 10	18 0	17 6	21 7
,, 24 ...	32 7	30 2	34 6	24 2	24 9	32 8	17 10	17 7	21 9
Mar. 2 ...	32 7	30 0	34 1	24 6	25 0	32 0	18 1	17 5	21 6
,, 9 ...	32 6	30 1	34 1	24 1	25 0	31 7	18 0	17 5	21 8
,, 16 ...	32 6	30 1		23 6	24 11		18 0	17 6	
,, 23 ...	32 9	30 2		23 7	25 0		17 11	17 5	
,, 30 ...	33 0	30 3		23 8	24 11		18 0	17 5	
Apl. 6 ...	33 6	30 4		23 1	24 7		17 11	17 7	
,, 13 ...	33 7	30 3		23 5	25 2		18 3	18 3	
,, 20 ...	33 7	30 4		23 0	25 5		18 3	17 10	
,, 27 ...	33 0	30 11		22 10	25 5		18 3	18 3	
May 4 ...	32 6	31 4		22 7	25 7		18 2	18 6	
,, 11 ...	32 1	31 8		22 0	25 1		18 1	19 0	
,, 18 ...	31 10	32 6		21 8	25 4		17 8	19 2	
,, 25 ...	31 3	32 8		21 4	25 0		17 10	19 5	
June 1 ...	30 2	32 5		21 8	24 10		17 10	19 5	
,, 8 ...	29 1	32 4		20 9	25 7		17 10	19 7	
,, 15 ...	29 0	32 3		18 11	23 11		18 0	19 8	
,, 22 ...	29 4	31 11		20 1	23 9		17 9	19 10	
,, 29 ...	29 9	31 10		19 11	24 5		17 7	19 9	
July 6 ...	30 4	32 1		19 5	25 10		17 4	19 9	
,, 13 ...	31 1	32 3		21 3	25 10		17 7	19 11	
,, 20 ...	31 11	32 5		19 9	24 3		17 5	19 5	
,, 27 ...	33 5	32 5		20 10	23 8		18 1	19 7	
Aug. 3 ...	33 9	32 0		20 5	24 4		18 3	18 2	
,, 10 ...	33 5	31 6		20 4	26 9		18 0	18 0	
,, 17 ...	32 11	31 6		20 11	27 8		17 11	17 10	
,, 24 ...	32 7	31 8		20 10	28 10		17 2	18 0	
,, 31 ...	32 2	31 7		22 10	28 4		17 2	18 3	
Sept. 7 ...	31 11	31 10		23 3	28 4		17 2	18 1	
,, 14 ..	30 11	32 0		24 3	29 0		16 6	18 5	
,, 21 ...	30 2	32 4		24 2	29 11		16 3	18 9	
,, 28 ..	30 1	32 6		24 4	30 5		16 4	19 1	
Oct. 5 ...	30 1	32 7		24 7	30 9		16 3	19 5	
,, 12 ...	30 2	32 9		25 1	31 0		16 2	19 10	
,, 19 ...	30 4	32 9		25 3	31 5		16 1	19 11	
,, 26 ...	30 4	33 1		25 4	31 7		16 2	20 6	
Nov. 2 ...	30 4	33 4		25 6	31 10		16 2	20 8	
,, 9 ...	29 11	33 4		25 4	32 7		15 11	20 11	
,, 16 ...	29 8	33 1		25 1	32 10		16 1	21 0	
,, 23 ...	29 11	33 0		24 10	33 5		16 4	20 10	
,, 30 ...	30 6	32 10		24 7	33 10		16 7	20 11	
Dec. 7 ...	30 9	32 9		24 3	34 0		16 9	20 9	
,, 14 ...	30 7	32 11		23 9	33 5		16 10	20 9	
,, 21 ...	30 7	32 9		23 10	33 5		16 9	20 8	
,, 28 ...	30 5	33 0		23 9	33 4		16 9	20 7	

NOTE.—Returns of purchases by weight or weighed measure are converted to Imperial Bushels at the following rates: Wheat, 60 lb.; Barley, 50 lb.; Oats, 39 lb. per Imperial Bushel.

AVERAGE PRICES of **Wheat, Barley,** and **Oats** per Imperial Quarter in FRANCE, BELGIUM, and GERMANY, and at PARIS, BERLIN, and BRESLAU.

—		Wheat.				Barley.				Oats.			
		1911.		1912.		1911.		1912.		1911.		1912.	
		s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
France:	January	46	11	44	4	26	3	28	8	21	6	22	9
	February	46	11	45	9	26	6	29	4	21	11	23	2
Paris:	January	48	3	46	11	26	2	28	8	22	9	23	5
	February	47	5	47	4	25	7	29	0	23	6	24	7
Belgium:	January	32	9	34	5	23	8	29	7	19	2	23	10
Germany:	January	41	2	44	7	27	10	36	2	21	5	26	11
Berlin:	January	43	2	45	3	—		—		20	11	27	0
Breslau:	January	38	3	40	2	27 22	2* 11†	32 28	10* 0†	19	8	25	2

* Brewing. † Other.

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the German quotations are taken from the *Deutscher Reichsanzeiger*, the prices for the German Empire representing the average of the prices at a number of markets.

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of February, 1911 and 1912.

—	Wheat.				Barley.				Oats.			
	1911.		1912.		1911.		1912.		1911.		1912.	
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
London...	31	7	35	2	24	3	33	4	18	7	23	4
Norwich	30	4	33	8	23	5	33	0	17	8	21	7
Peterborough	29	7	33	3	23	10	32	1	17	1	21	9
Lincoln...	29	10	33	3	24	11	32	0	17	4	21	4
Doncaster	29	8	33	5	24	7	31	10	16	11	20	10
Salisbury	29	9	34	1	23	9	34	8	17	4	21	9

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of February, 1912.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Bristol.		Liverpool.		London.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d. per 12 lb.	*s. d.* per 12 lb.	*s. d.* per 12 lb.	*s. d.* per 12 lb.	*s. d.* per 12 lb.	*s. d.* per 12 lb.	*s. d.* per 12 lb.	*s. d.* per 12 lb.
BUTTER :— British ...	18 0	16 0	—	—	17 3	15 9	17 0	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish Factory	—	—	124 0	120 0	—	—	—	—
Danish ...	—	—	138 0	135 6	137 0	135 0	133 0	—
French ...	—	—	—	—	148 6	146 6	—	—
Russian ...	131 0	127 6	—	—	130 6	127 0	—	—
Australian ...	132 0	129 0	132 0	129 6	129 0	127 0	132 0	130 0
New Zealand	134 0	132 0	134 0	132 0	132 0	130 0	134 0	130 0
Argentine ..	131 6	130 0	131 6	129 6	129 0	126 6	131 6	—
CHEESE :— British— Cheddar ...	96 0	85 6	89 0	85 0	96 6	90 0	78 6	76 6
			120 lb.	120 lb.	120 lb.	120 lb.		
Cheshire ...	—	—	89 6	82 0	95 6	90 0	—	—
			per cwt.	per cwt.	per cwt.	per cwt.		
Canadian ...	75 0	74 0	74 6	73 0	76 0	74 6	76 0	74 0
BACON :— Irish	62 0	57 0	62 6	57 0	66 6	62 6	64 0	—
Canadian ...	55 6	53 6	55 0	52 0	58 0	55 0	58 0	56 0
HAMS :— Cumberland ..	—	—	—	—	103 6	91 0	—	—
Irish	—	—	—	—	98 6	91 6	89 0	86 0
American (long cut)	53 0	50 0	54 0	49 6	57 0	53 0	56 0	—
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British ...	15 0	13 4	—	—	15 5	14 2	—	—
Irish	13 11	13 4	14 2	13 7	14 5	13 2	14 2	13 4
Danish ...	—	—	—	—	14 10	13 7	15 0	14 3
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton	per ton.	per ton.	per ton.
Edward VII.	92 0	82 0	70 0	65 0	81 0	71 0	—	—
Langworthy ..	89 6	84 0	85 0	80 0	99 0	89 0	70 0	65 0
Up-to-Date ...	88 6	77 6	66 6	63 6	82 0	72 6	60 0	55 0
HAY :— Clover ...	115 0	105 0	120 0	99 6	122 0	100 0	92 0	86 0
Meadow ...	110 0	100 0	—	—	116 6	94 6	—	—

DISEASES OF ANIMALS ACTS, 1894 to 1911.

NUMBER OF OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	FEBRUARY.		TWO MONTHS ENDED FEBRUARY.	
	1912.	1911.	1912.	1911.
Anthrax:—				
Outbreaks	114	93	206	178
Animals attacked	127	106	228	202
Foot-and-Mouth Disease:—				
Outbreaks	—	—	—	—
Animals attacked	—	—	—	—
Glanders (including Farcy):—				
Outbreaks	10	21	23	39
Animals attacked	12	92	45	155
Parasitic Mange:—				
Outbreaks	469	—	1,088	—
Animals attacked	960	—	2,703	—
Sheep-Scab:—				
Outbreaks	50	111	113	234
Swine-Fever:—				
Outbreaks	254	132	483	273
Swine Slaughtered as diseased or exposed to infection ...	3,771	1,547	6,311	3,070

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	FEBRUARY.		TWO MONTHS ENDED FEBRUARY.	
	1912.	1911.	1912.	1911.
Anthrax:—				
Outbreaks	1	2	1	3
Animals attacked	1	2	1	3
Glanders (including Farcy):—				
Outbreaks	—	—	—	—
Animals attacked	—	—	—	—
Parasitic Mange:—				
Outbreaks	12	13	20	21
Sheep-Scab:—				
Outbreaks	72	63	158	159
Swine-Fever:—				
Outbreaks	10	6	21	23
Swine Slaughtered as diseased or exposed to infection ...	46	178	192	459

SELECTED CONTENTS OF PERIODICALS.

Agriculture, General and Miscellaneous—

Aeration of the Soil by Earthworms, *J. Newton Friend.* [59.5; 63.11.] Weeds—Their Peculiarities and Distribution, *Winifred Brenchley.* [63.259(04).] (Sci. Prog., No. 23, January, 1912.)

Influence of Rice Bran upon the Manurial Value of Phosphoric Acid Contained in Oil Cakes, *Y. Kida.* (Jour. Col. Agr. Imp. Univ. Tokyo, Vol. I., No. 3, 1911.) [63.165.]

Untersuchungen über das Kalibedürfnis von Azotobacter, *Dr. Vogel.* [576.83.] Eine physiologische Studie über die nitratreduzierenden Bakterien, *E. B. Fred.* [576.83.] (Centbl. Bakt. [etc.], 2e Abt., 32 Band, No. 13–19, 27 Januar, 1912.)

Toxic excreta of plants, *F. Fletcher.* [58.11.] Carbohydrates of the mangold leaf, *A. V. Campbell.* [543.1; 63.332.] The amounts of nitrogen as ammonia and nitric (and nitrous) acid in the rainwater collected at Uithuizermeeden, Groningen, *J. Hudig.* [63.113.] A note on onion couch, *L. M. Underwood.* [63.259.] The direct assimilation of inorganic and organic forms of nitrogen by higher plants, *H. B. Hutchinson* and *N. H. J. Miller.* [58.11; 63.161.] The flow of water and air through soils, *J. W. Leather.* [63.11.] The phosphate nutrition of plants, *A. Baguley.* [58.11; 63.1672.] (Jour. Agr. Sci., Vol. IV., Part 3, January, 1912.)

Über Humussäuren, *Dr. Br. Tacke* und *Dr. H. Süchting.* [63.11.] Versuche über Stickstoffumsetzung in verschiedenen Böden, *Hugo Fischer.* [576.83.] (Landw. Jahrb., XLI. Band, Heft 5, 1911.)

Die Schwarzerde (Tschernosiom), *P. Kossowitsch.* (Internat. Mitt. Bodenkunde, Band I., Heft 3/4, 1912.) [63.111.]

An Ecological Study of a Cambridgeshire Woodland, *R. S. Adamson.* (Jour. Linn. Soc., Bot., Vol. XL., No. 276, February, 1912.) [63.49: 58; 58.19.]

Die Mobilisierung der Phosphorsäure des Bodens unter dem Einfluss der Lebenstätigkeit der Bakterien, *S. A. Sewerin.* [63.115.] (Centbl. Bakt. [etc.], 2e Abt., 32 Band, No. 20–25, 6 Februar, 1912.)

Field Crops—

Cultivation, Preparation, and Production of Flax and Linseed. (Bul. Imperial Inst., Vol. IX., No. 4, 1911.) [63.34111.]

Die Provenienzfrage bei Klee- und Grassaaten, mit Bezug auf deren Wertsbeurteilung sowie den heutigen Stand und zeitgemässen Anbau ihrer Gewinnung und ihres Verkehrs, *Dr. Albert Boerger.* (Landw. Jahrb., XLII. Band., Heft 1, 1912.) [63.33(*b*).]

The Influence of Time of Cutting upon the Yield and Composition of Hay, *C. Crowther* and *A. G. Ruston.* (Jour. Agr. Sci., Vol. IV., Part 3, January, 1912.) [63.198.]

Plant Diseases—

A disease of Sweet Peas, Asters, and other plants (*Thielavia basicola,* Zopf), *G. Massee.* (Roy. Bot. Gard., Kew, Bul. Misc. Inform., No. 1, 1912.) [63.24.]

Bedingungen der Hexenringbildung bei Schimmelpilzen, *Max Munk.* [63.24.] Rostige Getreidekörner—und die Über-winterung der Pilzspezies, *Jakob Eriksson.* [63.24.] (Centbl. Bakt. [etc.], 2e Abt., 32 Band, No. 13–19, 27 Januar, 1912.)

Copper Fungicides, *S. U. Pickering.* [63.295.] Bacterial diseases of plants, *M. C. Potter.* [63.23.] (Jour. Agr. Sci., Vol. IV., Part 3, January, 1912.)

ADDITIONS TO THE LIBRARY.

Agriculture, General and Miscellaneous—

States of Jersey, Technical Instruction Committee.—Report on Field Experiments in 1911. (17 pp.) Jersey: J. T. Bigwood, 1911 1*d.* [37(072).]

Memoirs of the Geological Survey, Scotland.—The Geology of Knapdale, Jura, and North Kintyre. (149 pp. + vii. plates.) London: E. Stanford, 1911. 3*s.* [55 : 912.]

Kinch, E.—Church's Laboratory Guide: Manual of Practical Chemistry for Colleges and Schools, specially arranged for Agricultural Students. [*Ninth edition.*] (*368 pp.*) *London: Gurney and Jackson, 1912. 6s. 6d.* net. [54(02).]

New South Wales, Dept. of Agriculture.—Farmers' Bull. 35:—Key to the Bathurst Experiment Farm. (15 pp. and maps.) Sydney, 1911. [37(072).]

Bricker, G. A.—The Teaching of Agriculture in the High School. (202 pp.) New York: The Macmillan Co., 1911. 4*s.* 6*d.* [37(02).]

Memoirs of the Geological Survey, England and Wales.—*On the Mesozoic* Rocks in some of the Coal Explorations in Kent. (212 pp. + v. plates.) London: E. Stanford, 1911. 3*s.* 6*d.* [55 : 912.]

Hitier.—Notes d'Agriculture—Les besoins des sols français en acide phosphorique. (848–853 pp.) [Bulletin de la Société d'Encouragement pour l'Industrie Nationale, Juin, 1911.] [63.111; 63.1672.]

Bangor, University College of North Wales.—Bull. 1, 1911:—*Experiments on the* Destruction of Charlock in Corn, 1911. (8 pp.) Bangor, 1912. [63.259.]

Bailey, L. H.—The Farm and Garden Rule-Book. (587 pp.) New York: The Macmillan Co., 1911. 8*s.* 6*d.* net. [63(022).]

Field Crops—

U.S. Dept. of Agriculture, Bureau of Chemistry.—Circ. 82:—The Unification of Reducing Sugar Methods. (A Correction.) (6 pp.) Washington, 1911. [63.343.]

U.S. Dept. of Agriculture, Bureau of Plant Industry.—Bull. 222:—Arrangement of Parts in the Cotton Plant. (26 pp.) Washington, 1911. [63.34113.]

Midland Agricultural and Dairy College.—Bull. 2 (1911–12):—Manuring for Milk. Third Interim Report. (17–23 pp.) Kingston-on-Soar. [63.33–16.]

Deutsche Landwirtschafts-Gesellschaft.—Arbeiten. Heft 196:—Über die Selbsterhitzung des Heues. (36 pp.) Berlin: Paul Parey, 1911. 1 M. [63.198.]

India, Memoirs of the Dept. of Agriculture, Botanical Series.—Vol. IV., No. 3:—Notes on the Incidence and Effect of Sterility and of Cross-*Fertilisation in the Indian Cottons.* (*37–72 pp.*) Calcutta, 1912. Re. 1. [63.34113.]

Herefordshire County Council.—Farmers' Bull. 6:—Report on the Manuring of Potatoes, Season 1911. (4 pp.) [63.512–16.] Farmers' Bull. 7:—Report on the Manuring of Mangels, Season 1911. (3 pp.) Hereford, 1912. [63.332.]

Virginia Agricultural Experiment Station.—Bull. 193:—Grass Culture. (23 pp.) Blacksburg, Virginia, *1911.* [*63.33(b).*]

Bangor, University College of North Wales.—Bull. II., 1911:—Mixtures of Grass and Clover Seeds. (11 pp.) Bangor, 1912. [63.33(*b*).]

Bedfordshire County Council, Agricultural Education Committee.—Report upon the Barley and Sugar Beet Plots, 1911. (7 pp.) 1912. [63.313; 63.3432.]

Horticulture—

U.S. Dept. of Agriculture, Bureau of Chemistry.—Bull. 145:—Enological Studies. The Chemical Composition of American Grapes grown in Ohio, New York, and Virginia. (35 pp.) Washington, 1911. [63.46.]

Woburn Experimental Fruit Farm.—Thirteenth Report. (151 pp. + 7 plates and Appendix.) London: The Amalgamated Press, 1911. 4*s.* 9*d.*, post free. [63.41(02).]

Plant Diseases—

New South Wales, Dept. of Agriculture.—Farmers' Bull. 34:—Friendly Insects. 18 pp. + II plates.) Sydney, 1910. [63.296.]

Nevada Agricultural Experiment Station.—Tech. Bull. 78:—Concerning the Relation of Food to Reproductive Activity and Longevity in Certain Hymenopterous Parasites. (30 pp. + x plates.) Nevada, 1911. [63.27(04); 63.296.]

Indian Forest Memoirs, Forest Zoology Series.—Vol. II., Pt. II.:—On some important Insect Pests of the Coniferæ of the Himalaya, with Notes on some Insects Predaceous and Parasitic upon them. (39 pp. + ix plates.) Calcutta: Superintendent Government Printing, 1911. 3*s.* [63.49-59; 63.27-49.]

India, Memoirs of the Dept. of Agriculture, Entomological Series.—Vol. II., No. 10:—Life-Histories of Indian Insects.—III. The Rhinoceros Beetle (*Oryctes Rhinoceros*) and the Red or Palm Weevil (*Rhynchophorus Ferrugineus*). (193–217 pp. and plate.) Calcutta, 1911. Rs. 2. [63.27.]

Lindinger, L.—Beiträge zur Kenntnis der Schildläuse und ihrer Verbreitung. II. (47 pp.) [Station für Pflanzenschutz zu Hamburg, Sonderdruck 22.]

Hewitt, C. Gordon.—On *Cœlopisthia Nematicida*, Pack.—A Chalcid Parasite of the Large Larch Sawfly, *Lygæonematus Erichsonii*, Hartig. (297–303 pp.) [Extract from The Canadian Entomologist, Vol. 43, September, 1911.] [63.27; 63.296.]

Live Stock—

United Provinces of Agra and Oudh.—Notes on the Indigenous Cattle of the United Provinces. (27 pp.) Allahabad, 1911. [63.6(54).]

Departmental Committee on the Export of Live Stock.—Minutes of Evidence, Appendices, and Index. [Cd. 6032.] (xiv + 216 pp.) London: Wyman and Sons, 1912. 1*s.* 10*d.* [63.6(42); 63.6 : 38.]

Wisconsin Agricultural Experiment Station.—Research Bull. 17:—Physiological Effect on Growth and Reproduction of Rations Balanced from Restricted Sources. (131–205 pp.) Madison, Wisconsin, 1911. [612.394.]

*Werner, Dr. H.**—Die Rinderzucht: Körperbau, Schläge, Züchtung, Haltung und Nutzung des Rindes. [Dritte Auflage.] (756 pp. + 128 plates.) Berlin: Paul Parey, 1912. 22 M. [63.62.]

Northumberland County Council, Education Committee.—Bull. 17:—Feeding Experiments with Cattle and Sheep at the County Agricultural Experiment Station, Cockle Park, 1910–11. (17 pp.) 1912. [63.62; 63.63.]

Halligan, J. E.—Elementary Treatise on Stock Feeds and Feeding. (302 pp.) London: Williams and Norgate, 1911. 10*s.* 6*d.* net. [63.604.] [The author is the Chemist in Charge of the Louisiana State Experiment Station.]

Dairying and Food, General—

U.S. Dept. of Agriculture, Bureau of Animal Industry.—Bull. 146:—Varieties of Cheese: Descriptions and Analyses. (78 pp.) Washington, 1911. [63.736.]

Midland Agricultural and Dairy College.—Bull. 1 (1911–12):—Report on Milking Machine Trials in 1909 and 1911. (16 pp.) Kingston-on-Soar. [63.713.]

Local Government Board, Reports on Public Health and Medical Subjects.—New Series, No. 60:—Report on analyses and methods of detection of certain proprietary substances sold as preservatives for milk, cream, &c. (7 pp.) London: Wyman and Sons, 1912. 2*d.* [543.2; 614.32.]

Economics—

Departmental Committee on Tenant Farmers and Sales of Estates.—Report. [Cd. 6030.] (42 pp.) 4½*d.* Minutes of Evidence, Appendices and Index. [Cd. 6031.] (245 pp.) 2*s.* London: Wyman and Sons, 1912. [333.5; 347(*a*).]

Millard, P. W.—Tithe Rentcharge Table, showing at a glance the Yearly and Half-yearly Values of any Tithe Rentcharge for the Year 1912. (20 pp.) London: Shaw and Sons, 1912. 1*s.* [348.]

Board of Trade.—Translation of the New Customs Tariff of Spain. [Cd. 6040.] (37 pp.) London: Wyman and Sons, 1912. 4½*d.* [337(46).]

National Congress on Rural Development and Small Holdings.—Report of the Proceedings held at the Crystal Palace, October, 1911. (247 pp.) London: P. S. King and Son, 1912. 2*s.* net. [338.1; 333.38; 06.]

Sagnier, H.—Le Credit Agricole en France; Ses Origines, son Essor, son Avenir. (xv+159 pp.) Paris: Librairie Agricole de la Maison Rustique, 1911. 3 Fr. [332.71(44).]

Board of Trade.—Report on Industrial and Agricultural Co-operative Societies in the United Kingdom, with Statistical Tables. (lv+273 pp.) London: Wyman and Sons, 1912. 1*s.* 8*d.* [334(42).]

Dop, Louis.—La Politique Agraire en Allemagne. (21 pp.) Rome: L'Institut International d'Agriculture, 1911. [333.5; 63(43).]

Hammond, J. L., and Hammond, Barbara.—The Village Labourer, 1760–1832: A Study in the Government of England before the Reform Bill. (418 pp.) London: Longmans, Green & Co., 1911. 9*s.* net. [331.]

U.S. Dept. of Agriculture, Bureau of Statistics.—Bull. No. 91:—Exports of Farm and Forest Products, 1908–1910, by Countries to which Consigned. (96 pp.) Washington, 1911. [31(73).]

Institut International d'Agriculture, Bureau de la Statistique Générale.—Le Service de Statistique Agricole, &c. (259 pp.) Rome, 1911. [31.]

Institut International d'Agriculture, Bureau des Institutions Économiques et Sociales.—L'Assurance Grêle dans quelques Pays, et ses Problèmes. (110 pp.) Rome, 1911. [368.5.]

Institut International d'Agriculture, Bureau des Institutions Économiques et Sociales.—L'Organisation de la Statistique de la Coopération Agricole dans quelques Pays. (163 pp.) [31; 334.]

U.S. Dept. of Agriculture, Bureau of Statistics.—Circ. 26:—Foreign Crops, November–December, 1911. (16 pp.) Washington, 1912. [31.]

Select Committee of the House of Lords on the Sales for Agricultural Purposes Bill. Report and Minutes of Evidence. (H.L. 237.) (183 pp.) London: Wyman & Sons, 1912. 1*s.* 9*d.* [343.53.]

Board of Trade.—Industrial Property and Merchandise Marks, Papers and Correspondence relative to the Recent Conference at Washington, for the Revision of the International Convention for the Protection of Industrial Property and the Arrangement for the Prevention of False Indications of Origin on Goods. [Cd. 5842.] (123 pp.) London: Wyman & Sons, 1912. 1*s.* [341; 343.53(b).]

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[*NOTE.—References to Insects and Fungi are indexed under the headings "Insects" and "Fungi" only, to Weeds under the heading "Weeds" only, and to Importation Regulations under the heading "Importation Regulations" only.*]

The names of the research and experiment stations at which the principal experiments summarised in the *Journal* have been conducted are indicated in italics, thus :—(*Rothamsted*). In the case of experiments conducted abroad, the name of the country is given.

Articles or reports on the following subjects appear in the *Journal* each month and are not separately indexed :—Notes on the Weather, Notes on Agricultural Labour in England, Notes on Crop Conditions in Great Britain, Notes on Crop Prospects. Reviews of the Corn Markets, the Live and Dead Meat Trade, and the Provision Trade, Prices of Agricultural Produce, Outbreaks under Diseases of Animals Acts, Prevalence of Animal Diseases on the Continent, Lists of Additions to the Board's Library, and Selected Contents of Periodicals.

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